RAILROAD GAZETTE

FRIDAY, DECEMBER 25, 1903.

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Contributions

The Manhattan Bridge Designs.

New York, Dec. 1, 1903.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In commenting on the letter of Mr. R. S. Buck in your issue of December 4, on the subject of the Manhattan bridge plans, permit me briefly to state the reasons for the chain bridge.

The Manhattan bridge will be only 1,500 ft. away from the present Brooklyn bridge, which is overcrowded with traffic. No thorough and lasting relief to the indescribable congestion on that bridge during rush hours can be expected until after the Manhattan bridge is completed. Quickness of construction is therefore one of the most essential elements to be considered in its plans. The slowness with which the wire cables were constructed for the Williamsburgh bridge, and also before that for the Brooklyn bridge, indicated the necessity of some system capable of more speedy erection for the Manhattan bridge. The four cables in the Brooklyn bridge required two years for completion. Those of the Williamsburgh bridge required 23 months for completion, not including one year of preparation after the contract for the cables was signed; so that the actual time for getting the four cables was nearly three years.

It is idle to dwell on the speed with which the wires were or may be manufactured and strung *after* all the preparations are made, and to deduce from such speed a reliable estimate of the entire time required for the building of such cables. That was precisely the way in which the original contract time of 10 months for the cables of the Williamsburgh bridge was determined. The 10 months commenced after the saddles on top of the towers were in place.

One of the things I was called upon to consider after assuming office on Jan 1, 1902, was the application by the cable making firm for a second extension of time, after the original 10 months had already been extended to 16 months. The firm had had a full year's time for preparation before the saddles were in place. One year after the saddles were in place only a few wires had been strung. The judgment of the Chief Engineer, Mr. L. L. Buck, was against a further extension of time, and I concurred in that judgment. As to the principal reason urged by the cable making firm for such extension, I quote from a letter of the John A. Roebling's Sons Company of New York, Dec. 2, 1901, to Mr. James D. Bell, Secretary of the new East River Bridge Commission:

"Any authority on suspension bridges would name not less than 20 months for such large cables as your bridge calls for."

The non-completion of the cables within contract time delayed the completion of the anchorages and the erection of the suspended structure, and therewith the completion of the entire work. (The delay at this day in the rail connections at either end of the bridge is due to causes outside of the control of the Bridge Department.) In view of that experience with a firm which claims the most skill and practical knowledge in that line, the expectation of getting four wire cables of the kind and large size required, in a very much shorter time than 1½ years, does not seem to be well founded.

The erection of eye-bar chains, on the other hand, is one of the simplest and oldest operations in bridge construction. The Point Bridge in Pittsburg is the longest chain bridge in this country. It is an 800 ft. span. The chains, 8 in. x 40 in., were erected in a few weeks. That was done 28 years ago with the meagre erection plant of that time.

The first plans for the Manhattan bridge provided for wire cables combined with stiffening trusses and had not progressed beyond the tentative stage. They were not adequate for the expected traffic. It was very desirable that the capacity of the bridge should be made larger and that the stability of the anchorages should be beyond question. The lengths of end spans was therefore shortened. No contract drawings or specifications of any sort were ready for the structure above the tower bases. The tower foundations, a simple work, had been designed, and one was contracted for. There was no money in sight for the early execution of the entire work, even had the plans been ready, because of the city's so-called debt limit. That obstacle was removed only last summer through the wise financial policy of the present administration. The money appropriated up to the present time is required for the completion of the tower foundations and for land purchases. The great necessity of building that bridge with rapidity, when more money for it shall have been appropriated, led to a study of different plans capable of rapid execution, and preferably by one and the same contractor for all the metal work of the superstructure.

Large wire cables cannot be built by bridge works. They are not equipped for it. Experience teaches that where more than one contractor is engaged on the metal superstructure, delays are inevitable. One contractor delays the other. They are in each other's way. Differences as to room for plant and for the storage of material on the limited ground are the fruitful source of claims of damages. No fast progress can be made, because co-operation cannot be enforced. The largest bridge in existence, the Forth Bridge in Scotland, a most difficult work, was built by one firm, and in a shorter time than was at first estimated.

Several large bridge firms are ready to compete, on the basis of the present plans, for the erection of the Manhattan bridge superstructure within three and one-half years. The same work combined with the wire cables in the Williamsburgh bridge took nearly six years, which was one year longer than estimated.

For the length of span here considered, a chain bridge, because of its greater mass, has greater rigidity than a wire bridge; in fact, it has the same rigidity as a cantilever bridge, which would otherwise be the cheaper type of construction. Architectural considerations favor the chain bridge as the one more suitable for artistic treatment. There is no doubt among bridge engineers as to the merits of a chain bridge at same cost as a wire bridge, or even at greater cost. With nickel steel for the eye-bars the cost is, however, not greater than for steel wire cables. Great care was taken to obtain authentic information from steel makers on nickel steel, which is 50 per cent. stronger than the best structural steel. I prefer to leave that question to be discussed by the steel makers themselves.

Mr. R. S. Buck states that I intended to use my patented wire links for the chains, which I had proposed in the competitive plans for a railroad suspension bridge over the St. Lawrence River at Quebec. The correctness of that gratuitous statement I deny, as I have denied it once before. Wire work in any form did not, in my judgment, promise the advantages of a chain bridge, provided that eye-bars of the requisite kind were obtainable, as they now surely are. Mr. R. S. Buck says that my plans for a wire link suspension bridge over the St. Lawrence River at Quebec failed of adoption. That is true, but he neglected to say that among the competitive designs of cantilever and suspension bridges, a cantilever bridge was found to be cheaper than any of the wire suspension bridges. Four or five competitive plans (of both types) had been submitted for this bridge by different firms on the same basis of unit stresses and specifications. While nothing has as yet been published about them, the result is well known. The objections raised by Mr. R. S. Buck against the design of the Manhattan chain bridge have all been made before from time to time. It is not my purpose here to answer them. I have already answered some of them in communications to the *Engineering News*, and the others hardly merit discussion, at least when addressed to bridge engineers.

One of the most curious attacks, however, and one probably never heard before, on a report made by a board of five engineering experts, of international reputation, is on the ground that they had been misled, or, so to speak, hypnotized, and that the experts were subject to a "wave of impressionism." Arguments of that kind, revamped at a time when a change of city government is to take place, do not appear like a coincidence, and can hardly be meant for engineers.

The Manhattan bridge is a work to be carried out by a city government, subject to the accidents of political changes, and there is much room for opposition of a non-meritorious sort. Nevertheless, I believe that the more the design for the bridge is honestly discussed, the better its merits will be understood.

GUSTAV LINDENTHAL,
Commissioner of Bridges.

Engineering Design of the Williamsburgh Bridge.

TO THE EDITOR OF THE RAILROAD GAZETTE:

When, in August, 1895, I became Chief Engineer of the Williamsburgh bridge the first question to settle was capacity. After discussion with the first Commission it was decided to have two roadways, four trolley tracks and two elevated railroad tracks. These were arranged with the two elevated railroad tracks in the middle. On each side of the elevated railroad tracks were two trolley tracks, and outside of the trolley tracks a 20 ft. roadway on each side of the bridge.

After the distribution of the tracks it was determined that it would make the bridge too wide to carry the footwalks at the same level and consequently it was decided to have them above the main floor. The tracks and roadways together required a width of 120 ft. At that time there was a demand also for bicycle paths. I never liked the idea of the bicycle paths, as I considered that the roadways having all the vehicles on each one moving in the same direction, and from the fact that the bicycles were obliged to move on the roadways of the streets, there was no apparent reason why they should not use the roadways of the bridge.

The bridge was designed for four cables; two on each side to be cradled, but in opposite directions, for the purpose of assisting the lateral steadiness of the bridge against wind pressure. The cables were designed for straight wire laid parallel and each length of wire coupled to the end of the preceding length; these wires to go around shoes secured to the eye-bars of the anchorage by pins, and to avoid difficulty of future examination of the cables, instead of serving the whole length of the cable with wire closely wound, it was decided to cover the cables with thin steel plates that could easily be taken off for purposes of inspection.

The suspended structure of the bridge for the purpose of stiffening was provided with two trusses; each truss is 40 ft. in depth and attached to the pair of cables on the same side. The connection between the truss and the two cables is formed by an equalizer or lever, at each end of which one cable is secured, and consequently the weight is equally distributed between the two cables. We are thus sure when we have two trusses of having the loads on the roadway equal on the two cables which are attached to each truss, and there being two trusses symmetrically placed with reference to the cross section of the suspended structure we are sure of equal distribution on all the cables, except in case of a high wind pressure when the windward cables will have a slight increase and the leeward cables will have slightly less stress.

As before explained the elevated railroad tracks are located in the middle of the cross section of the suspended structure. On each side of these are two trolley tracks, and outside of this again on each side are roadway floors. It was decided to have these six railroad tracks between the trusses of the suspended structure and place the roadways outside of them, one on each side. It was designed also to have the railroad tracks laid on wooden ties supported by steel beams. The carriage-way floors at first were to be of 5 in. white oak planks laid lengthwise of the bridge in one thickness. Later on the difficulty of procuring these white oak planks caused me to meditate on using yellow pine instead of oak. A roadway floor of this kind of yellow pine laid lengthwise, and after being laid to have coarse gravel sprinkled over them and rolled firmly with a heavy road roller, would, I believe, prevent any serious slipping of horses. It would make a smooth floor over which vehicles passing would cause very slight vibrations, and those planks which became worn and needed to be replaced would be the only ones that would require renewal, except in case of decay. The footwalks were also to be of planks about 2 in. thick.

The towers are of steel columns thoroughly braced, eight columns to the tower on each side of the river. The distribution of the roadways and tracks were to be passed through the towers, the tracks in the middle portion or opening, and the roadways to pass through between the columns of that side of the tower. This fixed the width of the tower at the roadway. The cradling of the cables before mentioned and position of the trusses fixed the position of the columns at the tops of the towers, as it was desirable to have each pair of columns rest directly under the saddles in which the cables were to rest. This arrangement gave considerable batter to the towers above the roadway in a transverse direction. In the longitudinal direction the tower at the roadway had a width of 40 ft. longitudinally, and at the top of the tower about a width of 20 ft. was required; and the saddles are 19 ft. long and between centers of the columns at the top longitudinally there is a distance of 15 ft., making a batter in that direction. If this same batter was continued on down to the masonry supports there would be an enormous horizontal component of the weight resting on the tower foundations, which would necessitate having the foundations of the tower very heavy or with the same average inclination, to satisfy this horizontal thrust, consequently it was decided to carry the columns from the roadway

down to the foundations vertically, by which means we could provide for the horizontal thrust by way of tension members at the roadway, and the structure below the roadway would then be subject to but a slight transverse stress, and the load would come vertically upon the foundations, as it ought. These tower columns are 4 ft. in diameter, built up of steel plates and angles and consequently hollow. On account of the width of the plates in proportion to their thickness it was necessary to have them stiffened at vertical distances of 8 to 10 ft. This it was decided to do by means of diaphragms riveted through the plates. To enable each cable to be inspected within, it was necessary to cut openings through each diaphragm from the bottom to the top of the towers large enough to allow a man to easily pass through. At the bottom of the tower there was an opening in one side with a steel door provided with louvre slats to allow a man to pass in, and iron ladders were designed to extend from the bottom column up into the saddle chamber at the top of the tower. Then to prevent condensation of moisture inside it was thought best to make a peaked house over each pair of saddles, and at the top of each there will be a ventilator to cause a continuous current of air through the whole column and saddle chamber.

The anchorages had to be built where there was no rock to which to fasten them. The anchorages are built of chain formed by flat eye-bars in length connected by pins of sufficient strength to safely sustain the stress brought upon them by the cables and attached to heavy steel castings at their lower ends with heavy steel girders above these castings on which a great part of the masonry of the anchorage should rest, and these chains were attached to the wires of the cables, as before explained. The masonry is in heavy courses faced with granite, the interior of limestone. The United States government required the middle 400 ft. of the span of the bridge to have an elevation of 135 ft. at mean high water of spring tide clear of the underside of the floor.

The approaches, including the length of the bridge from one street on one side to the street on the other required a length of 7,200 ft. This length was required to prevent heavy grades in getting up to the bridge. To make this of heavy masonry structures and arches would be very expensive, would take a long time to build, and in case it was desired to change the grade of the approaches it would be a matter of great difficulty to accomplish it, and it was thought much better to build the greater part of these supports to the approaches of columns and girders which in case of necessity could be more easily changed than heavy arches and masonry, besides taking up very much less room on the ground.

The first Commission, appointed by Messrs. Strong and Schieren, near the last of its term of office had decided to employ Messrs. Carrere & Hastings to prepare plans for artistic decorations of the structure. These gentlemen came over to my office at 84 Broadway, Brooklyn, and spent part of a day going over all the plans, and were to prepare their own plans from these. Shortly after, a change of administration came, and the result was that nothing further was done about architects. There was some talk of architects, but nothing was decided upon by the second Commission, and meantime I had sketches made for two houses on each tower each to cover a pair of saddles, and the roofs of these houses were four sided, going up to a peak, with a ventilator in the top to discharge the air coming up through the columns. A more satisfactory shape to my mind was to make the four sided roof concave outward, as presenting very little wind surface, and it appeared to me would look better.

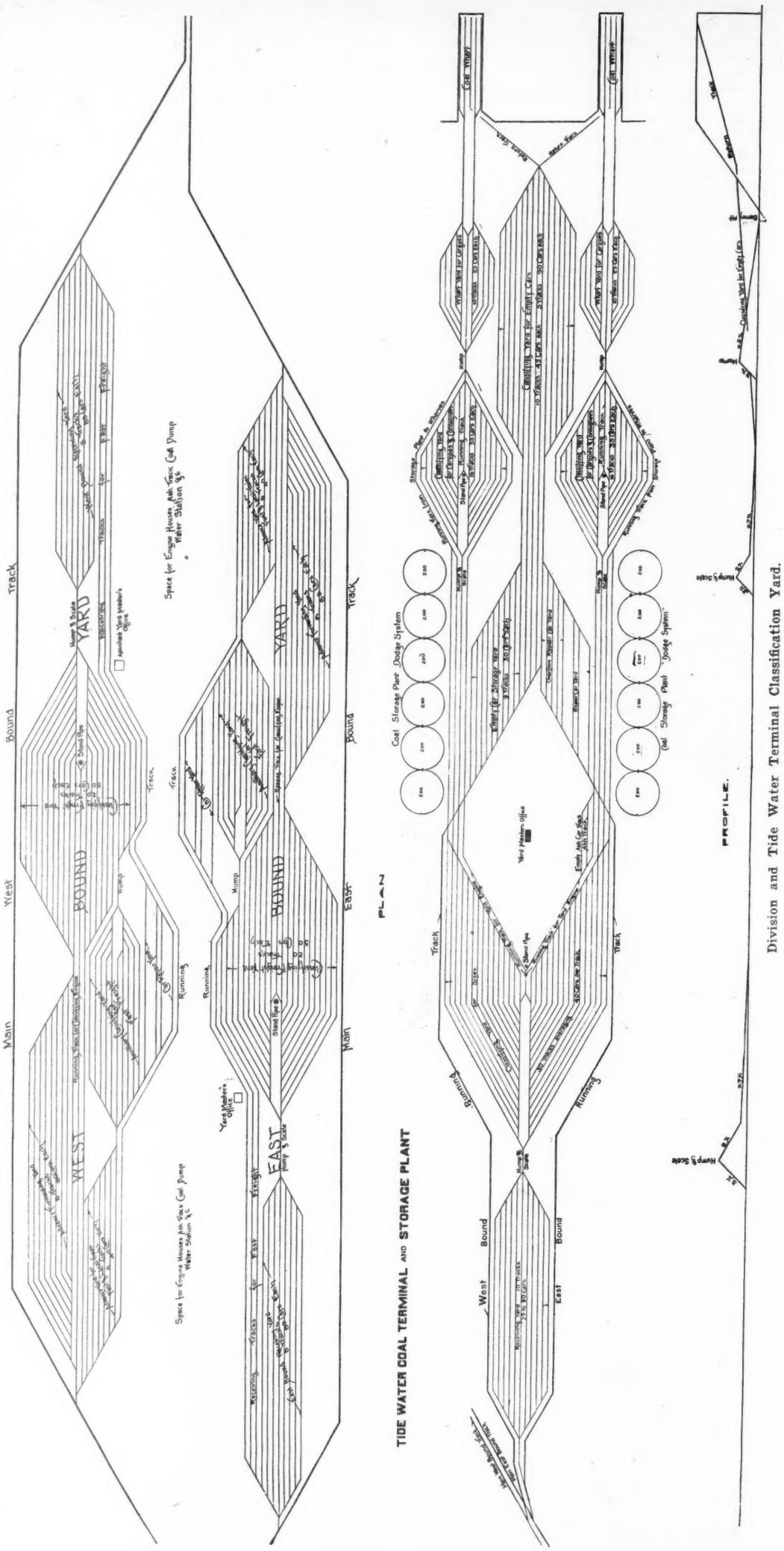
At the roadway where the outer columns of the tower received a bend I considered that the best way to treat it would be to have a balcony around the tower from the roadway, and at each corner of that balcony to erect a large ornamental lamp post with large electric lights on top. These lamp posts to be about the height of the trusses. I still think that they would have appeared very well.

When the new Commissioner came he decided to make some changes in the structure, among those being to employ an architect to decorate the bridge and to lay a brick pavement for the roadways instead of the planks which had been originally intended. The dead weight of the main span of the bridge was estimated at 13,020 lbs. per lin. ft., roadways and all. With the new floor which was adopted by the Commissioner the total weight of the main span per lin. ft. is estimated at 13,965 lbs., an increase of 945 lbs. per lin. ft. on the main structure.

It was thought first that the bridge should start from Broadway, Brooklyn, and land on Grand street, New York, but when it was considered that Grand street had but a width of about 70 ft. and was already congested with traffic, both street car and roadways, it was seen that to add the traffic of a bridge 120 ft. wide to it would be entirely out of the question, and to widen Grand street the necessary amount for the bridge would be a very expensive operation, because the property is held at a high rate. It was decided it would be better to land on the south side of Delancey street, and 150 ft. in width was taken the length of the New York approach, and the land between South Fifth and South Sixth streets on the Brooklyn side in a straight line of the bridge, bringing the Brooklyn approach or plaza along the side of Broadway.

In this way it was expected that by the time the bridge was done the cities would have additional railroad tracks to take care of the incoming and outgoing passengers, and the former intention was to have a good large plaza at each end of the bridge for the distribution of its passengers.

I prepared a plan (very soon after getting the plans of the bridge started) for cutting a diagonal street from the northwest corner of Manhattan plaza to the intersection of the roadways of Third and Fourth avenues. It was submitted to the first Commission, but that Commission did not consider that it had anything to do with the building of the bridge. This idea met with considerable opposition on the question of cost. Five or six years ago the cost would not have been over $5,000,000 for the right of way, as far as could be learned from appraisals, and would have been a great advantage in connecting the bridge with First, Second, Third and Fourth avenues directly, besides forming a diagonal street, which in connection with Broadway would extend a large part of the way from one side of the city to the other, and would have raised the value of property in that section sufficiently to pay for the cost of the right of way. One great advantage of cutting this diagonal street through would be if they wanted to work the bridge



with the subway on Fourth avenue, while removing the buildings, they could go on and make the excavations for the subway and build the structure in it, and the pavement placed on top in the authorized time, so it would not interfere with street traffic, and when they got this subway they could extend it down toward the City Hall by West Broadway or Madison street that runs nearly diagonal, and in that case they would have a second subway system well under way and which could be continued on First, Second or Third avenues as might be required and make easy connections.

LEFFERT LEFFERTS BUCK.

Design and Operation of Division and Tide-Water Terminals.*

BY C. L. BARDO.

Mr. Bardo considers that the most perplexing transportation problem of the age, following on two years of extraordinary prosperity, is that of terminal facilities, and that the congested condition of the railroads has been chiefly due to three causes; inadequate facilities, shortage of motive power, and subordinate inefficiency. Portions of his paper follow:

There are in use to-day three separate methods of switching, viz.: push and pull, poling or ramming, and hump gravity. The first system is used to a considerable extent in some of the large yards, and almost exclusively in local distributing yards. The second system is used in the West Seneca yards of the Lake Shore railroad, just west of Buffalo, at Pitcairn, Altoona, Harrisburg, Philadelphia and Jersey City on the Pennsylvania; Buffalo and Dewitt on the New York Central; Packerton and Perth Amboy on the Lehigh Valley, and in a number of other large yards throughout the South and West. The Belt Line yard at Chicago represents the highest extreme in the development of the hump yard, followed by the Pennsylvania lines west, at Conway, Honey Pot, and an auxiliary yard at Harrisburg, the Pittsburg & Lake Erie at McKees Rocks, Pa., and Haseltown, Ohio, the New York Central at Oak Grove, Pa., and the Lehigh Valley at Coxton, Oak Island and Jersey City. Of these the Conway yard of the Pennsylvania lines west represents the most comprehensive adaptation of the hump to division terminals, although the Pittsburg & Lake Erie yards at McKees Rocks and Haseltown, Ohio, and the Pennsylvania yard at Honey Pot, Pa., are particularly adapted to the class of traffic passing through them, and, therefore, show a remarkable operating efficiency.

In order to demonstrate clearly the superiority of one method over the other, the writer has prepared a table showing the time and labor required to do a given amount of work by each of the three systems. For the purpose of this demonstration we have selected a train of 60 cars with 50 cuts.

	Push or pull.	Ram or poling.	Hump or gravity.
Number of cars....	60	60	60
Number of cuts....	50	50	50
Consist of crew....	Engineman Fireman Conductor Two trainmen	Engineman Fireman Conductor Six trainmen	Engineman Fireman Conductor Six trainmen
Time consumed....	2 hr.	1 hr. 15 min.	30 min.
Wage expense.....	$2.44	$2.55	$1.02
Distance traveled by locomotive, ft....	*24,750	*24,750	†6,000
Cars handled	1,541	60	60
Engine reverses....	120	120	60

*Estimated at 250 ft. in each direction for each cut, or 500 ft. for the round trip. †Estimated at twice the length of the train to cover the return trip.

It will be noted from the table that the last, or hump method, requires one-quarter the time of the push and pull, and two-fifths the time of the poling method. In engine service the hump method requires one-quarter the reverses of either of the other two. In the number of cars handled there is no difference between the poling or hump systems, both showing an astonishing economy over the push and pull method. In handling the train by the first-named method, assuming that the train was moved 250 ft. in each direction, for each cut we find that the engine service is equivalent to 137 car-miles. In addition to the amount of time required to handle a train under the push and pull method, due consideration should be given to the question of expense, on account of damage to lading and equipment by air brake and reversing shocks. The figures above given were obtained from actual tests, under favorable grade conditions, for the first method, and similar, though unfavorable, track facilities for the other two. The results above noted indicate plainly the superiority of the hump method over either of the other two, for the classification of trains.

The prevailing grades at present are, for the first class, one to one and one-half per cent.; second class, one and seven-tenths per cent., and for the last, two to two and one-half per cent., leading from the apex of the hump to the first classification switch, falling off to one-half per cent. grade for the first class, seven-tenths per cent. for the second class, and eight-tenths to one per cent. for the last class, from the last switch to the yard level.

While there is no fixed rule for determining the size of division terminals, a careful canvass indicates that they vary in car standing room from one-half to two full days' run. It is the writer's judgment that a modern division terminal should be large enough to accommodate at least one and one-half days' run, divided between the classifying, receiving and advance yards; that is to say, that the car capacity of the classifying yard should equal the combined capacity of the other two. Where the freight movement is free and regular, and not subject to frequent interruption or complete stoppage for extended periods by train accidents or other causes, the size may be reduced; but in no case should it be less than that required to take care of a full day's run, with ample provision for enlargement as the business grows and the interruptions become more frequent and trying.

When the freight movement from a division terminal is regular throughout the 24 hours, and where the classifying yard can be made large enough to provide ample tracks for each of the principal classifications, the advance forwarding yard can be dispensed with, as it would not be required, except to take care of the overflow from the classifying yard during suspension of road movements. If, however, the schedule of passenger and high-speed trains is such as to interfere with the regular movement of freight trains, making it necessary to start them in convoys, then the advance yard is an important adjunct and should be provided if at all possible.

With the ever increasing demand of the public for better time, the heavy power now in use, together with the Government regulations, it is important that the terminal facilities be ample to provide for the most comprehensive classifications, both as to destinations, class of freight and class of equipment, in the order named. As a general proposition, on a line where there are a number of yards, the work can be divided so that each terminal can take care of its proportionate share, based upon facilities and favorable operating conditions, that the classification by destinations may, in some cases, be reduced to meet purely local conditions.

Freight is divided into three classes, viz.:

1. Live stock, fresh meat, poultry, fruit, vegetables, butter and eggs, produce, etc.

2. Packing house products, merchandise, new grain, H. H. goods, and such other commodities as require special attention.

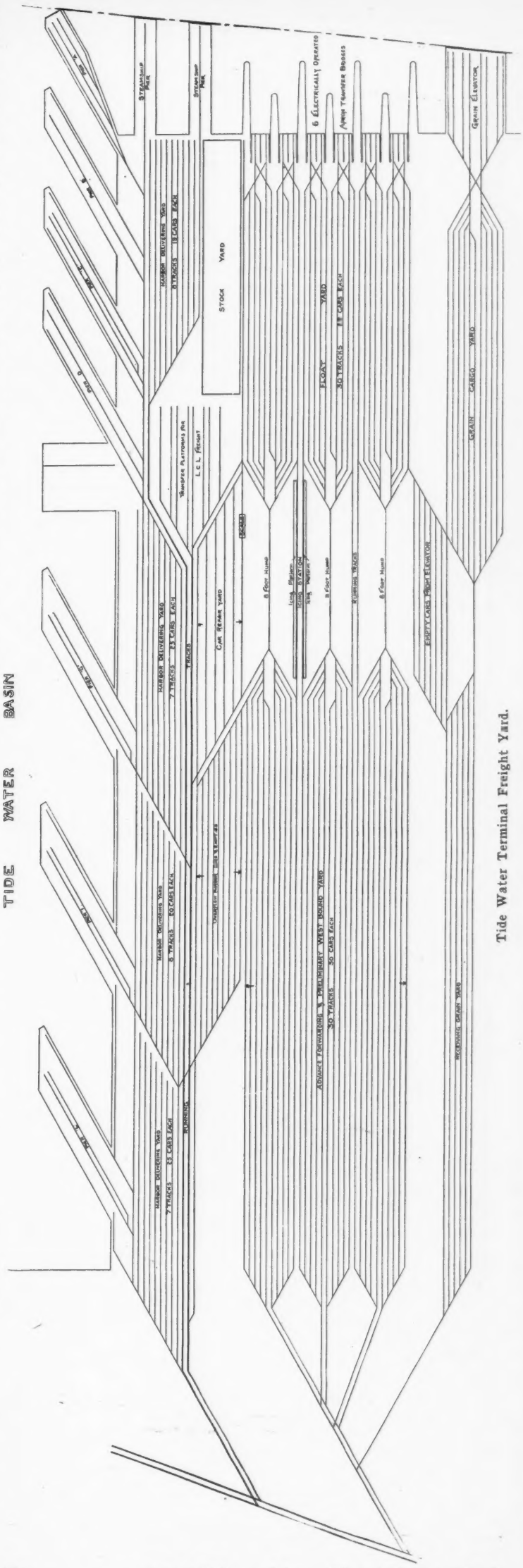
3. All other freight, including minerals and mineral products.

Equipments are divided into two classes, viz., air-brake and non-air-brake cars.

It may be found advisable at points where trains are operated over heavy grades with pushing engines, to make an additional separation of old equipment in order to keep it from getting into train at a point where it is likely to be damaged by ordinary handling. Under the present safety appliance Act of Congress, all freight trains must have at least 50 per cent. of their cars equipped with air and in service. Therefore, the necessity of providing sufficient tracks to make these classifications, where a large part of the equipment is not supplied with air-brakes, is too apparent to require further thought.

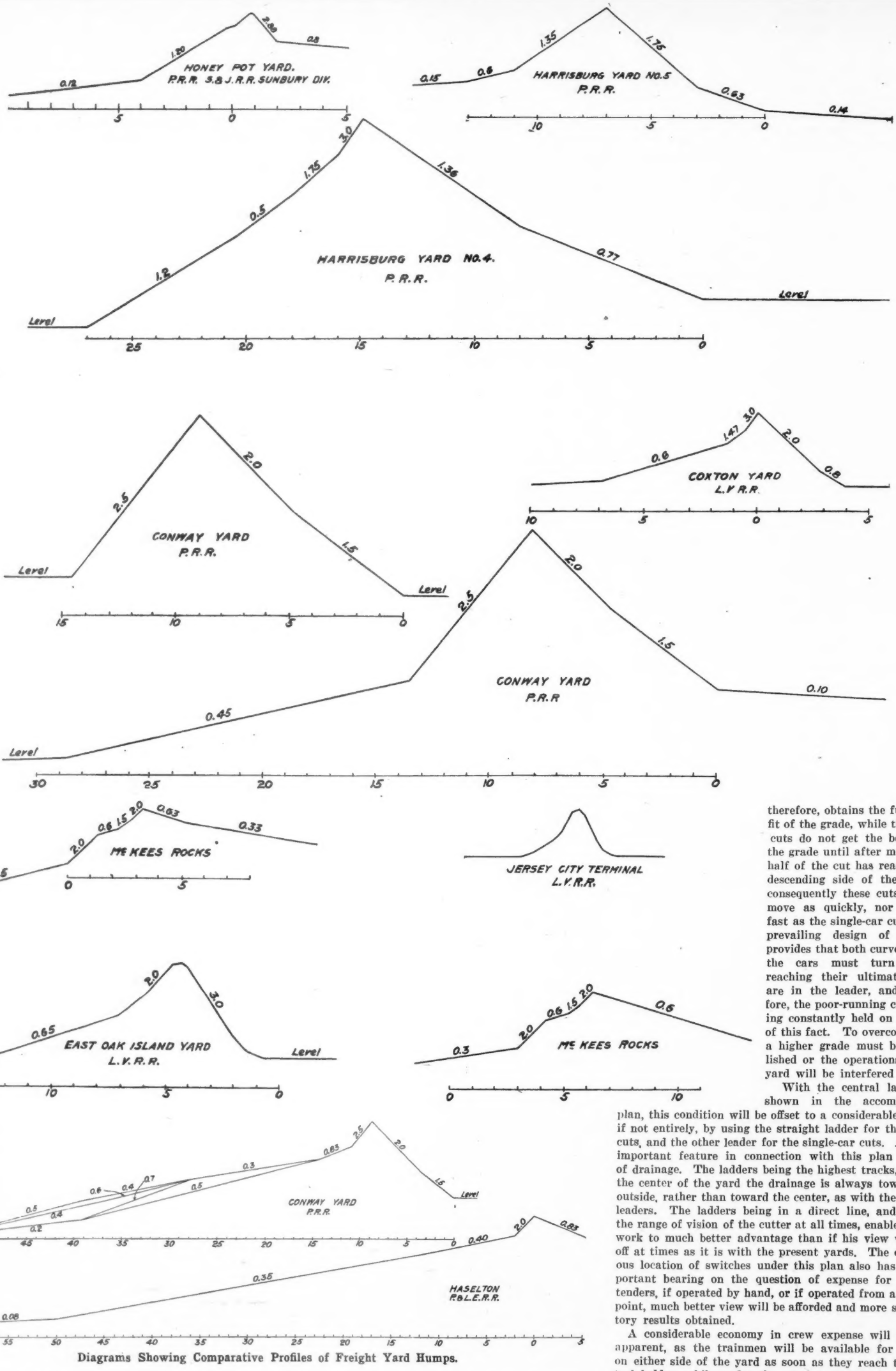
A separate classifying yard should be provided for fast and local freight trains, and so located that important cars from slow trains can be cut out with first handling and given preferred movement. Next in importance is the location of car repair tracks, so that cars can be placed upon the shop track at first handling and sent forward after release without unnecessary drilling or delay.

Independent running tracks should be located so as to fit as nearly as possible the current of traffic within the yard, rather than in accordance with established main-line customs. Unless relief engines are used, time and money will be saved by providing stand pipes and ash track convenient to the point where classifying engines are engaged. Where the ordinary division requirements cannot be provided for in a yard of 25 original distributing tracks, or where it exceeds 12 hundred cars each way per day, it is



Tide Water Terminal Freight Yard.

*From a paper presented before the New York Railroad Club, Dec. 18, 1903.



Diagrams Showing Comparative Profiles of Freight Yard Humps.

my judgment that it would be more economical from an operating standpoint to provide two yards than it would be to undertake to handle the current business and provide for natural increases with a yard of thirty or more tracks. The limits of a single-track throat are quickly reached, and we have all found to our dismay that it cannot be stretched. The plans or diagrams submitted herewith embody some features not heretofore brought out in connection with hump yards.

In the first place, the varying size of the cuts have an important bearing upon the design and operations of the yard. We have found from experience that there is a substantial difference in the running qualities of the various kinds of cars under similar load, which is augmented adversely as the load lightens. In addition to this, we find that the single-car cuts run much further than those of three cars or more, which is due to the fact that the single car is released as soon as it passes over the apex, and, therefore, obtains the full benefit of the grade, while the latter cuts do not get the benefit of the grade until after more than half of the cut has reached the descending side of the hump: consequently these cuts do not move as quickly, nor run as fast as the single-car cuts. The prevailing design of ladders provides that both curves which the cars must turn before reaching their ultimate track are in the leader, and, therefore, the poor-running car is being constantly held on account of this fact. To overcome this, a higher grade must be established or the operations of the yard will be interfered with.

With the central ladder as shown in the accompanying plan, this condition will be offset to a considerable extent, if not entirely, by using the straight ladder for the larger cuts, and the other leader for the single-car cuts. Another important feature in connection with this plan is that of drainage. The ladders being the highest tracks, and in the center of the yard the drainage is always toward the outside, rather than toward the center, as with the outside leaders. The ladders being in a direct line, and within the range of vision of the cutter at all times, enable him to work to much better advantage than if his view was cut off at times as it is with the present yards. The contiguous location of switches under this plan also has an important bearing on the question of expense for switch-tenders, if operated by hand, or if operated from a central point, much better view will be afforded and more satisfactory results obtained.

A considerable economy in crew expense will also be apparent, as the trainmen will be available for service on either side of the yard as soon as they reach the central ladder, while under the present or "V"-shaped ladder they are not available for cars going to the opposite side of the yard until they have again reached the distributing point at the head of the yard. The open space between the ladders permits of the location of electric light poles at a point where the lights are most needed, with a considerable saving in the number of lights required to properly light that part of the yard.

In places where there is much snow, the central ladder will be found to possess advantages over the "V"

ladder, on account of its higher location and consequent greater freedom from snow when accompanied by winds of ordinary velocity. The location of weigh scales is another important matter. If the hump is used, they should be on the descending grade so that cars can be separated and weighed by gravity without re-handling. The same argument also applies to the location of ice houses and track connections for the prompt handling of shipments running under refrigeration. The most violent complaints, and the heaviest claims to-day, originate from delays to shipments of this kind, or from damage due to failure to re-ice when required. Where advance forwarding yards are not provided for the assembling of road trains after being classified, an elevated caboose track should be located convenient to the outlet of the classifying yard, so that cabooses can be attached to outgoing trains with the least possible delay.

At important lay over terminals for road men, it is essential that some provision be made for their comfort during their off-duty hours, and for this purpose a building should be erected within ready reach of the yard master, but still far enough away from the noise to enable men to obtain their much-needed rest. A few hundred dollars spent in the construction, equipment and maintenance of such a building will be found to be a very desirable and remunerative investment.

With an all-gravity yard where the hump is used and where the grade of the classifying yard is above .7 per cent., it will be found that the cost of operation will be greater than if the yard is level, or practically so. In the first case, cars must be escorted by trainmen for the entire distance to avoid damage, while in the latter case cars can be left to go alone after passing off the hump grade, leaving the trainmen available for another cut much more quickly than if he had to remain with the car until it stopped. Another disadvantage of the all-gravity yard is the trouble experienced by road engines in coupling up their trains, as they are not able, in many cases, to back more than half of the number of cars needed for a road train, necessitating the use of the yard engine to assist them. Even with grade enough to start them without assistance, the danger of damage from collision is ever present with its costly and annoying results.

In a tide-water freight terminal the requirements are in a general way the same as in the ordinary division terminal, with the exception that greater detail of classification and standing room for cars temporarily held back must be provided for. In determining the size of a tide-water terminal for a given amount of business, it is not necessary to provide for such a complete detail of classification for eastbound business, as with a division terminal, for the reason that the exacting road conditions and Government regulations do not have to be complied with. Westbound, ample provision should be made for the complete classification of trains of every class, so that they can be made up in proper station order and in strict compliance with the law.

In order to treat the matter more intelligently, let us suppose that we were called upon to design a tide-water freight terminal to take care of a business of say 1,000 cars per day, as a minimum, with classifications as follows:

1 of 300 cars for connecting line floats.
1 of 100 cars for connecting line floats.
1 of 50 cars for connecting line floats.
3 of 35 cars for floats; pier delivery.
3 of 25 cars for floats; pier delivery.
1 of 45 cars for local yard.
1 of 100 cars for elevator.
7 of 35 cars for lighterage delivery.

To handle this business it would require 14 trains of 50 cars of slow freight each, and 10 trains of 30 cars fast freight each 24 hours. We should, at least, provide for an increase of 50 per cent. in business, or 36 trains per day. Receiving yard should be large enough to take care of a six-hour run, and would, therefore, contain nine tracks: six slow and three fast. Assuming that classifying tracks holding 50 cars each would be the most economical from an operating standpoint, we would be required to provide, at least, 18 tracks to meet only the actual needs. By providing a yard with 24 classifying tracks with an auxiliary, we obtain a total of 36 classification tracks, or twice the number actually required. This would result in the greatest elasticity of yard forces and consequently a very favorable pay roll exhibit. With many of our present yards it is only possible to work one engine at any given point at one time, so that the capacity of the yard in many instances is measured by the capacity of one engine and crew. By arranging your tracks so that one engine can take care of a particular line of work, under normal conditions, and so that two or more engines can be worked simultaneously when necessary, you provide for a very large increase in business by adding enough power to take care of it.

If the 36 classifying tracks above referred to were put upon one ladder, it would mean that only one crew at a time could be worked at that point, and that as soon as your business equaled the capacity of the crew, you will have reached your operating limit. With the auxiliary yard, two engines can be worked advantageously in handling road trains, and their work may be lightened by bunching some of the smaller classifications for rehandling at another point. From the classifying yard the business must be moved forward, the connecting line freight to the float yard, harbor and local freight to their respective destinations.

Assuming that the topographical and other conditions permitted of a level yard, we have placed a hump between the advance and float yard, so that additional classifications can be made at that point, if necessary, but with the particular view in mind of utilizing the float crews to the fullest advantage, by having them make preliminary separations of westbound business, as it comes from the floats while waiting for floats to be bridged. The arrangement of tracks provides that four float loads of cars may be put at the head of each bridge, and as the tracks are connected at both ends, two engines can be worked on the one bridge continuously, if necessary, thus providing track facilities again for that elasticity of forces so essential to the most economical results.

Cars for harbor delivery are separated into seven classes, viz., packing house products, hay, flour and milling products, iron, warehouse freight, such as agricultural implements, glucose, wire, nails, copper, lead and bonded freight. By having a separate auxiliary yard for each of these classifications, convenient to piers and unloading points, the very best results will be obtained by maintaining a high percentage of cars unloaded to available bulkhead space. With the cars in ready reach, they need not be ordered to the stringpiece until boats are available, which should keep the bulkhead open at all times for cars requiring immediate delivery. In the delivery of cars to floats will be found the most serious problem in connection with a tide-water terminal, on account of the influence of unfavorable tides or weather conditions.

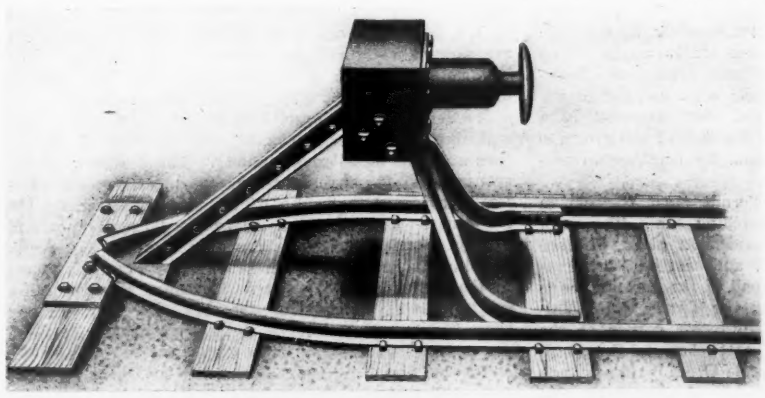
With a properly designed electrically operated apron transfer bridge, and by this I mean a bridge that can be operated at all stages of the tide, a vast saving of time will be effected and a corresponding increase in the number of floats handled. With pontoon bridges there is a considerable loss in crew time on account of the engine being used to make the float fast, while with the apron bridge this work is done by the bridgemen. The approaches to the bridge should be double-tracked, so that two engines can be used in loading floats if necessary. In putting 80,000 and 100,000 capacity loaded cars aboard floats, it is almost imperative that both sides of the float be loaded simultaneously to prevent undue straining of the bridge and float. The bridges should be far enough apart to permit of building a protective rack, at least 200 ft. long, on each side of each pair of bridges, and the whole protected from the tides and winds by piers on each side. With the protective rack between each pair of bridges, the loading of floats can proceed without interruption while floats are being put in or taken out of adjacent bridges.

Classification requirements of a tide-water coal yard are the most complex of all:

1st. On account of the varying sizes and grades of coal, and check marks or marks of identification.
2nd. The inability to reconcile the water or dock requirements to land condition.
3rd. The extra drilling required to properly mix coal from storage with road coal in assembling cargoes.
4th. The ever-changing demands of the trade, cutting out, frequently, entire prepared cargoes, and substituting others, to meet some temporary emergency.

In considering the design, the most important points are:

1. The number of cars and cargoes to be handled per day.
2. The number of cars to and from storage ground daily.
3. Average number of cars held on track daily.
4. Receiving tracks to take care of road trains.
5. Ample tracks and car standing room in main classifying yard, to take care of active and non-active classifications.
6. Ample tracks and room in sub-classifying yard to take care of a full day's run.



The Commonwealth Bumping Post.

7. Sufficient tracks and room in cargo yard to take care of a half-day's run.
8. Classifying yard for return empties.
9. Car repair yard for return empties.
10. Interlocking towers at main line connections.
11. Central plant for the operation of switches in main classifying yard.
12. Running tracks for yard engines.
13. Auxiliary ash track, stand pipes, etc., convenient to point where regular engines are employed.
14. Scales for weighing road and storage coal.
15. Yardmaster's office to be centrally located.

Generally speaking, the classifications are:
First: By sizes.
Second: By consignees.
Third: Into cargoes.

The first classification is divided into seven parts, viz., rice, buckwheat, pea, chestnut, stove, egg and broken. The second is divided into anywhere from 20 to 100 parts. The third, as a broad proposition, only into as many parts as would equal the number of cargoes for a given day.

In the handling of road trains we classify, first, for sizes, cutting out all coal which, under the ordinary practice, is in active demand, and filling, as far as possible, all orders to which the road coal will apply, classifying, as far as possible, for cargoes in the first separation, and separating, at the same time, any coal that should go into storage. The cargoes are then moved to the cargo yard and finally classified, remaining groups are moved to the sub-classifying yard, coal wanted for immediate delivery cut out for cargoes, the balance separated by consignees and sizes, according to the requirements of the established dock practice. The cargo yard is built on a grade so that cars will run from any part of it over the barney pit. The grade of the empty return track is used to make the necessary separations of empty cars, as they come from the dock, with sufficient tracks to hold at least a full day's run. In the diagrams submitted you will note that a central lead to classifying yard is used, for the reason that in classifying both sizes and cargoes, single car cuts largely predominate.

The successful operation of any yard depends upon three things, viz.:

1st. An efficient organization.
2nd. Ample facilities and power.
3rd. A complete record of car movements.

We have placed the organization first, for the reason that whether the facilities are good or bad, ample or deficient, the measure of success depends entirely upon the efficiency of the organization.

The most carefully planned and well adapted facilities would be made to appear deficient in the hands of an inefficient organization, while an up-to-date organization would, if given a fair show, partially, if not entirely, minimize the disadvantages accruing from inadequate facilities.

The importance of a perfect record of car movements in any yard is beyond question. Generally speaking, they are kept in three ways: First, on printed forms showing the numbers and initials as they stand on track or in trains, without regard to ending figures, series or anything else, which would aid in their location or movement. This is the oldest and most prevalent form. Second, on the card index, a system similar to that used in filing correspondence, which is a very good record, but somewhat more expensive that any of the others. Third, the ending figure system which is kept in various ways. Some prefer to have it kept in books—an expensive method both as to cost of labor and supplies. Others keep it on large square sheets, divided into as many squares as are required to cover the series of numbers handled, using one square for each thousand series. In addition to this, if the conductors' reports of trains are kept by ending figures on suitable forms, carefully checked and filed, you will have the most complete and readily accessible, as well as the most economical yard record that can be devised.

The Commonwealth Bumping Post.

The accompanying illustration shows a new design of bumping post brought out by the Commonwealth Railway Supply Company, Chicago. The two track rails are curved inwardly at their terminal ends resting in a W shaped recess cut out in the end tie. The ends are fastened by a triangular plate which is held in place by bolts which pass through the rails and plate. A rectangular undercut recess in this triangular plate forms the foot for the compression brace. This brace is made of two straight rails placed side by side with filling blocks bolted in place. The two tension standards are made of rails. The lower end of each standard is bolted to the track rail with a filling block and is also additionally held in place by spikes in the tie. The upper ends of the standards are fitted in a socket and are secured in place by transverse bolts which pass through the saddle. The upper ends of the rear braces bear against the flanges of the standards and are held in place by bolts which pass through the saddle. The buffer cylinder contains a coiled spring for absorbing the shock.

The strain is primarily sustained by the tension standards which transmit the shock to the track rails, and by the compression brace which also transmits the shock to the track rails. The efficiency of the bumper does

not depend upon the ties to which it is secured. Should an unusual strain be placed upon the bumper the tendency of the curved track rails is to straighten out, thereby acting like a spring and absorbing the shock.

The Westinghouse Foundry at Trafford City.

A description of Trafford City, Pa., the new industrial center created by the Westinghouse Foundry Company, and of the foundry plant and pattern shop to be built for the Westinghouse Machine Company, was given in the *Railroad Gazette*, Oct. 3, 1902. A tentative layout for tracks and buildings was printed at that time, which has since been modified. The important changes were the omission of the large number of storage tracks adjacent to the east ends of the buildings, the erection of separate buildings for the laboratory and lavatory, the sand house, and for the offices and a brass foundry—which was not in the original plan, and the addition of a locomotive house to the west end of the power station.

The general scheme of the track system was explained in the previous article, the object being to provide a track alongside of each building and transversely through the end. In order that each of these tracks might be an independent stub track from the yard system, the buildings were not laid out with their ends parallel to the longitudinal yard tracks. Instead they were set in a slightly oblique direction, with the end of each of the larger buildings far enough beyond its neighbor to permit the stub tracks to enter.

The track arrangement will permit great freedom in receiving, distributing and despatching cars. The main line of the Pennsylvania Railroad is a short distance west of the works. Parallel to, and east of, the Pennsylvania is the Interworks Railroad of the various Westinghouse industries ranged along the Turtle Creek Valley. Running north past the southwest corner of the first factory area and turning east close to the south side of the second area is the Turtle Creek Valley branch of the Pennsylvania. Incoming cars and supplies will be received on this line, while outbound product will be sent around the 28-deg. curve on the west side of the works, or through the Y south of this curve and over the Interworks road to East Pittsburg, where the works of the Westinghouse Machine Company are located.

In the revised plan the transverse tracks along the south sides of the buildings connect the longitudinal tracks on the east and west sides, while those on the north sides of the buildings are stub tracks originating in the east longitudinal system. In addition to this system of standard-gage tracks there is a narrow-gage industrial system serving the foundry and yards. This system is operated by 10-ton electric storage-battery locomotives.

The structural features of the buildings were briefly given in the previous article. They are steel and brick structures with concrete foundations, slate roofs, and floors of slow-burning mill construction. The pattern shop and storage building is 605 ft. long, 80 ft. wide and 47 ft. high to eaves. The pattern shop occupies 160 ft. of the east end and has two floors. The second floor is supported from the roof trusses, leaving the lower floor unobstructed by columns, giving the greatest possible freedom for handling large patterns. The storage section has three floors, and the length is divided into three compartments by transverse fire walls. Sections through both ends of the building, showing the frame work, were given in the previous article. The foundry building is 611 ft. 8 in. by 184 ft. 3 in. outside, and is 36 ft. high at the eaves and 80 ft. at the peak. It is a three-bay building, the center bay being 80 ft. 3 in. wide, and the side bays 50 ft. 6 in. The engraving from a photograph of the interior shows it to be well lighted. The walls are painted white and the trusses dark green.

A notable feature of the foundry is the large number of electric traveling crane. In the center bay there are seven Sellers cranes, four being of the traveling jib type, and three 80-ft. bridge cranes, one of which is of 100 tons and two of 60 tons capacity. The reach of the jib cranes is 35 ft., enabling a pair on opposite sides practically to cover the width of the bay. They travel the full length of the building below the larger cranes and do not interfere with the movements of the latter. A detail of the support for these two sets of cranes is shown in the engravings. There are six 20-ton Morgan cranes in the side bays, three on each side. In the north bay there is one on each side of the melting department, and one serving the charging floor exclusively.

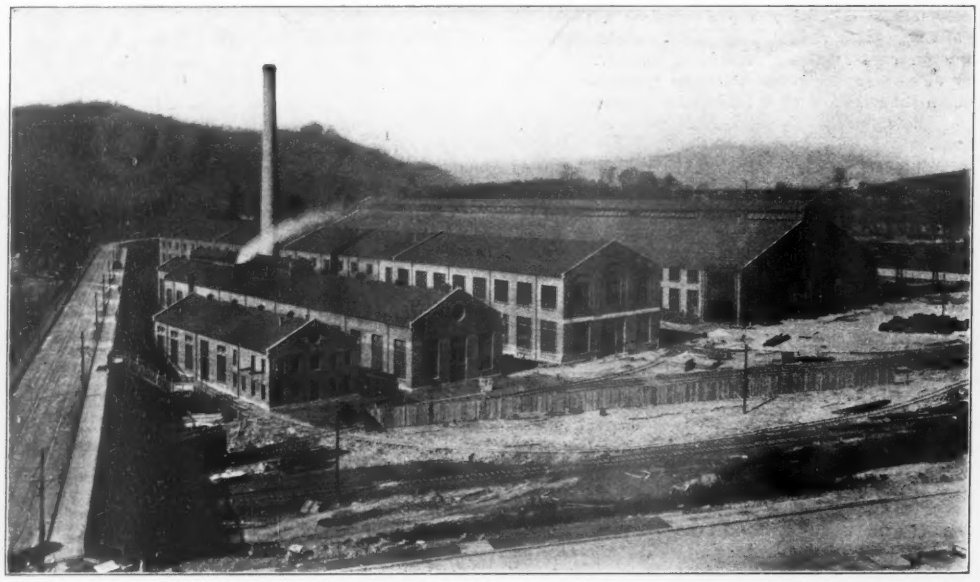
The melting facilities comprise two air furnaces of 30 tons capacity each, built by the S. R. Smythe Company, Pittsburg, and three Whiting cupolas each of 18 tons hourly capacity. The furnaces, which are at the ground level, are charged from the outside of the building. They will melt any size of scrap that can be charged through the ample door opening, and yield a superior quality of iron, used for the larger castings. The plan of the foundry shows three ladle pits near these furnaces, two being in front and one at the west side. The west furnace is arranged to discharge into two pits at one time if desired.

The core ovens are in the south bay opposite the melting department. There are two ovens, each divided into six compartments of varying sizes for the different-size cores, all departments being closed by Kinnear rolling doors. Natural gas or coke can be used for heating. The core department occupies the space between the ovens, which are 120 ft. apart. The foundry is managed practically as two separate foundries, each one being under a separate foreman. Steam engine castings are made in one end and gas engine castings in the other.

The material and storage yard is north of the foundry building. It has two tracks, one on each side, one of which is continuous and the other a stub. The industrial road also crosses it transversely about midway of its length, and is projected to run around it along the north side. This yard is served by a Sellers double-trolley 50-ton crane of 100 ft. span, traveling the full length of the yard. Pig iron and fuel are stored in the eastern half of the yard, along the center of which is a transfer-table pit 205 ft. long in which are small scale cars. The industrial cars are run on these scale cars and loaded, and are afterward raised to the charging platform by hydraulic lifts. Or the material is weighed on trays which are lifted by the yard crane to a platform supported on brackets on the outside of the building at the level of the charging floor. In the west half of the yard scrap for the air furnaces, flasks and heavy apparatus used in the foundry operations are stored.

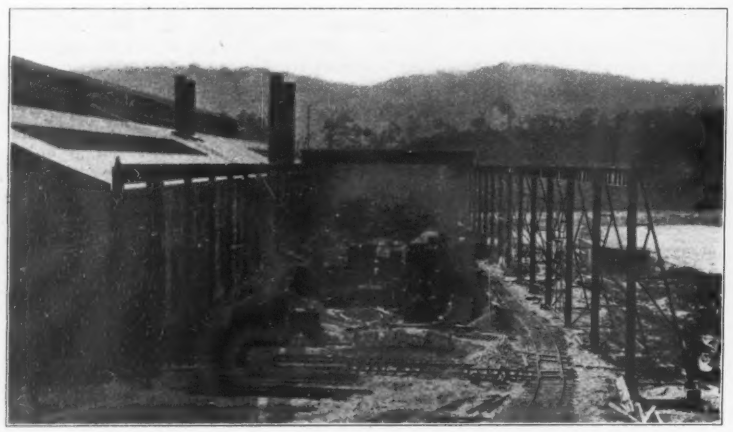
The brass foundry and offices occupy one building. The foundry is 40 ft. x 80 ft., has six pit furnaces and facilities for 20 moulders. Crane service is afforded by hoists supported from lorreys running on the lower flange of an I-beam bridge which moves longitudinally on I-beam runways. One of these cranes is on each side of the building, but not spanning half the width. This leaves an unserved section in the center which is bridged at two points by short lengths of I-beams secured to the adjacent runways of the two cranes in such a way that the cranes may be brought with their ends opposite those of a bridge piece and the lorrey of one crane run over onto the other. The office part of the building is occupied by the business department of the foundry downstairs and as a drafting room up stairs.

The pattern shop is well lighted both naturally and artificially, by ample windows and skylights, and by arc and Nernst lamps. The facilities of the department include those for kiln drying and storing the lumber, hydraulic elevators, and a complete equipment of wood working tools and appliances. The pattern and storage departments will be enlarged as the needs of the We-

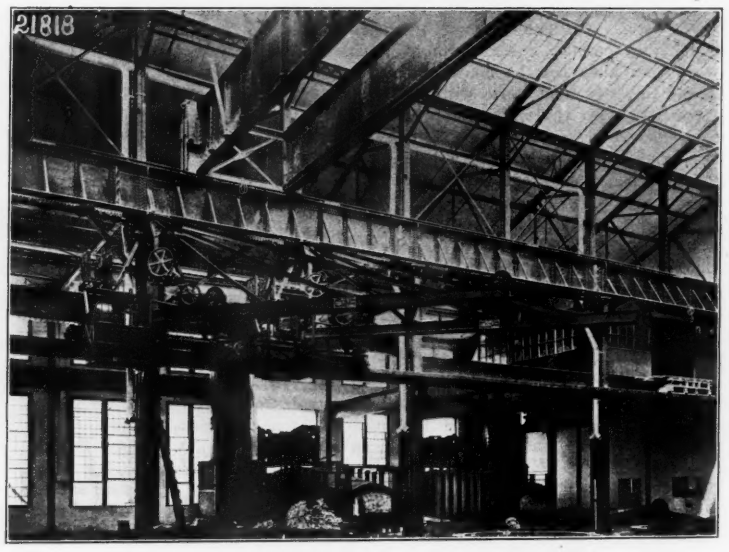


General View of Westinghouse Foundry Co.'s Plant at Trafford City, Pa. Viaduct on Left and Turtle Creek Valley Railroad in Foreground.

Looking East in Foundry—Core Ovens on Right.



Storage and Material Yard (Before the Completion of the Plant).



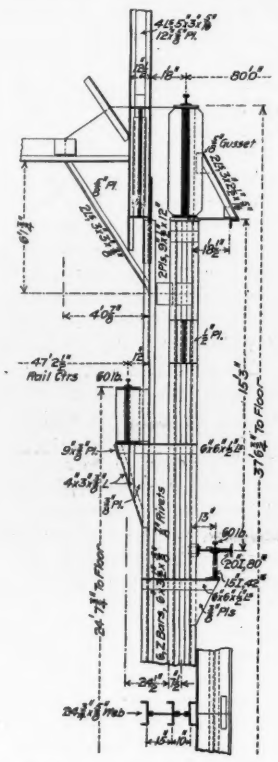
Traveling Jib Cranes—Air Furnaces on Ground.

inghouse Machine Co.'s foundry, and of the other Westinghouse companies relying on the services of this foundry, may require.

The power house is 320 ft. long and 56 ft. wide, divided into boiler room, engine room and machine shop, the latter being 40 ft. x 56 ft. and equipped to take care of the mechanical repairs to all machinery and equipment about the plant. The power plant has been designed to furnish power for all the foundries that will be located at Trafford City. The present equipment represents only a part of the ultimate capacity of the plant. The boiler room has space for four 500-n.p. boilers, two, of Babcock & Wilcox make, being now installed. They are equipped with Roney stokers and are fed from overhead bins. The coal is delivered in drop-bottom cars on the north side of the building and is discharged into a pit from which a Link-Belt elevator, inclined at about 60 deg. with the horizontal, conveys it overhead to a conveyor which distributes it to the bins. Ashes are dumped into cars running under the floor to an elevator on the north side of the building which carries them overhead and delivers them into a bin over the coal track, from which they are discharged into a car.

The power room equipment at present comprises a 1,000-h.p. Westinghouse Corliss cross-compound horizontal engine, 24 in. and 40 in. x 48 in., direct connected to a 600-k.w. three-phase 440-volt generator, running at 94 r.p.m.; a 10 in. and 18 in. x 10 in. Westinghouse vertical compound engine direct connected to a 50-k.w. direct-current, 115-volt generator; a 14 in. x 18 in. three-cylinder Westinghouse gas engine of 175 h.p., direct connected to a 120-k.w. double-current generator —250 volts direct current and 440 volts alternating current—running at 250 r.p.m.; a 6 in. x 8 in. three-cylinder gas engine, direct connected to a 125-volt d.c. generator; a 110-h.p. motor-generator set; and an Ingersoll-Sergeant air compressor. A 15-ton Maris hand-power crane serves the room. There is space for a duplicate of the Corliss unit. The gas engine plant is for the night load. The engines for the latter get their gas from a well 1,900 ft. deep on the premises. The power and lighting feeders and air, steam and water pipes are run in an underground tunnel from the power station to the other buildings.

Between the pattern and storage building and the foundry are two buildings, one being a sand shed built of wood, and the other a lavatory and laboratory building built of steel and brick. The former is 34 ft. x 128 ft., and is served both by the standard and narrow-gage tracks. It is equipped with suitable machinery for preparing the sand for foundry purposes, including crushers, and rotary and reciprocating riddling machines.



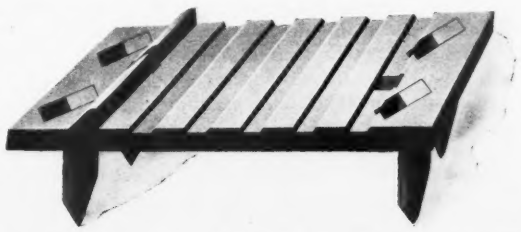
Detail of Support of Foundry Crane Girder.

The lavatory and laboratory building is 34 ft. x 60 ft. The upper floor has the foundry foremen's offices, a room for first aid to the injured, a chemical laboratory and janitor's quarters. The lower floor has an excellent equipment of wash-basins, shower baths, closets and lockers.

The buildings are heated by the hot-blast system. Ordinarily the plant will employ about 600 men, though the facilities will accommodate 1,000, which busy times would require.

Shoulder and Stud Tie Plates.

The difficulty of holding the shoulder of a shoulder tie plate firmly against the rail base and so maintaining the gage is entirely overcome in the plate illustrated, because the claws are made independent of the plate, and are in the form of "studs," which pass through narrow slots in the plate. The plate can be placed loosely be-



neath the rail, and its shoulder forced against the rail flange after gaging the track, and when the plate is in this perfect position, the studs are driven. Excessive lateral thrust occurs on sharp curves and it is in here that the claw and shoulder plates are generally used. After being in track awhile the head of the outside rail is cut or worn off by wheel flanges, and the gage is thus widened. To re-gage, it is necessary, with the ordinary shoulder plate, to raise the claws or flanges out of the holes already made in the tie, and shift it several inches to another location, where the claws can take fresh hold. This leaves the old claw holes open to water and decay, and is objectionable.

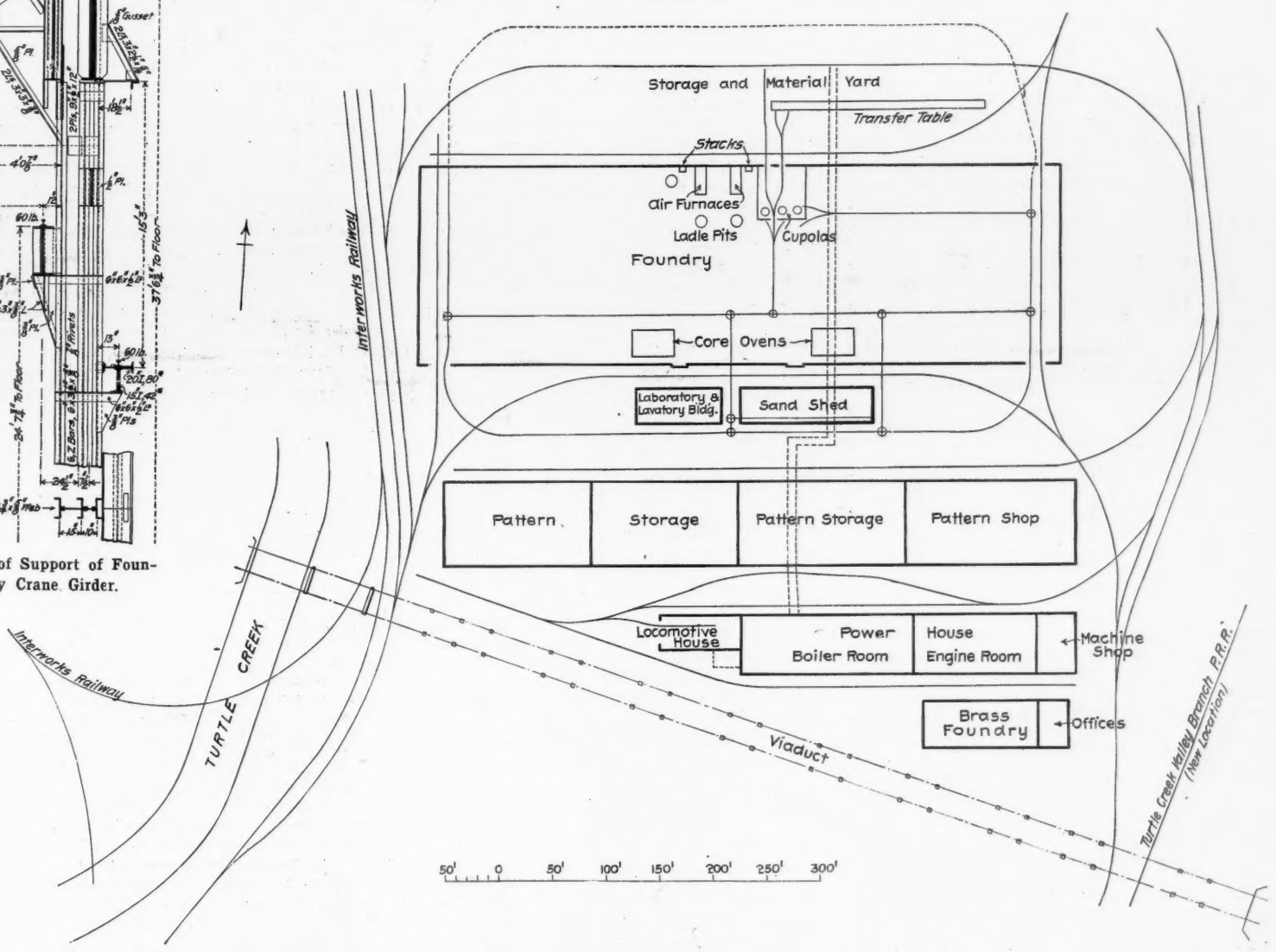
With the plate illustrated, the studs are placed in slots, which are at an angle to the shoulder, and these slots are longer than the studs, the latter being placed at one end of them. When readjustment of the plate is required, it is only necessary to slide the plate on the tie without removing the studs. This longitudinal movement of the plate forces it laterally inward, and thus gaging of the track is renewed without making additional holes in the tie. The depth of the claws or flanges on the ordinary shoulder plate is limited by the process of manufacture; they extend into the upper soft part of the tie only about an inch, whereas these studs can be made longer and reach into the heart of the tie, giving a much greater holding power than with any short claw or flange.

In the illustration shown herewith, the studs are shown outside the rail, but these can be placed beneath the rail as well, and by some this location might be considered the preferable one. The studs can be driven in the tie before they are placed in track, and the plates placed on them after the ties are in track, thus economizing the cost of application. It will be noticed that the top of the plate has a series of shallow grooves in it; these grooves are to prevent sand wear, so noticeable in all smooth top plates. Made by the Independent Railroad Supply Co., Chicago.

Foreign Railroad Notes.

The Austrian State Railroads have issued regulations fixing the time allowed for loading and unloading cars delivered on private side-tracks, etc. The general rule is that 24 hours will be allowed when the car is to be unloaded and returned loaded; but when freight presses, as at harvest, etc., eight hours only will be allowed for loading or unloading, or 12 hours for both; and when there is an extraordinary pressure of traffic the time may be reduced to six and nine hours. The hours are counted between 6 a.m. and 8 p.m., which may be changed when there is danger in handling the freight in the dark, to 7 a.m. and 5 p.m. during the three winter months. The penalty for holding a car over time is 4 cents an hour. (The cars generally have 27,500 lbs. capacity.)

An official of the Paris, Lyons & Mediterranean Railroad was nominated by one of the political parties as a candidate for Parliament. Thereupon he applied to the company for leave of absence to make his canvass. This was refused him on the ground that it would be prejudicial to discipline for one of its officers to be a candidate before and enter into discussions with his own subordinates. He must either give up his candidacy or his position on the railroad. The officer did not resign, but continued his candidacy. He was summoned several times by the company to return to his duties by a certain day or consider himself discharged. Paying no attention to this, he was declared discharged. Receiving no considerable number of votes at the election, the official demanded that he be reinstated on the railroad, and when this was refused, he sued the company for 100,000 francs damages, for breach of contract. He was defeated with costs on trial and also on appeal; and so is now neither deputy nor railroad inspector. A bird in the hand is worth two in the bush. This was the Radical Anti-Collective Socialist bush; and doubtless that party is now more than ever down on the railroad companies.



Plan of the Westinghouse Foundry Co.'s Plant at Trafford City, Pa.

RAILROAD GAZETTE

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ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

Car and Locomotive Output for 1903.

Official returns from all but two car building plants in the United States, show that 154,808 cars have been built during the year 1903. As the two firms from which we have not heard turn out a total of less than 2,000 cars we have estimated their output from our own record of their work and added the sum obtained to the above total. This figure includes all freight and passenger cars built for elevated and steam railroads, exclusive of those built by the railroads at their own shops, and exclusive of those built for street and other electric service. Careful estimates have been made by all the large car plants for their output during the month of December, so the total given above is very nearly correct. Of this total figure, approximately 152,801 are freight cars and 2,007 are passenger coaches; 153,195 for domestic use and 1,613 for export. Last year the total number of cars built was 164,547, which is about 9,700 in excess of this year. The decrease has occurred in the last two months, as up to that time the output for 1903 was equal to the output for the first ten months of 1902.

During the year 5,152 locomotives were built at the various locomotive works in the country, as against 4,070 last year. This figure is officially correct, as complete returns have been received from every locomotive building plant in the United States. The number includes 88 electric locomotives. The increase over 1902 is the largest that has ever occurred in one year, and is possibly due to the fact that the locomotive works in the country had such a volume of orders placed during 1902, that they were unable to make immediate deliveries, and many of the orders were held over until 1903. Returns from Canada show that 55 locomotives have been built by two firms, one of which has only recently begun operations. In analyzing the report it is interesting to note what this total of 5,152 really means, by calculating the expenditure involved. At an average cost per locomotive of $12,000, the total amount spent by the railroads for motive power would be approximately $62,000,000. This figure of course does not include the locomotives which are built yearly by railroad companies at their own shops. The following table shows our figures for locomotive building during the last 12 years:

1892	2,012	1898	1,875
1893	2,011	1899	2,473
1894	695	1900	3,153
1895	1,101	1901	3,384
1896	1,175	1902	4,070
1897	1,251	1903	5,152

Locomotive Counterbalancing.

The problem of the counterbalance involves the use of higher mathematics for its solution, and it is not often that the locomotive designer has either the time, inclination or perhaps the facility to delve into the maze of signs and symbols. These solutions, although uninviting to the practical man, form a necessary basis for correct design. In Dec. 11 issue of the *Railroad Gazette* was an abstract of a paper by Mr. R. A. Parke on the above subject. The formulae which he has deduced are rigidly correct, and have the added value of being easily applied. Those who have become imbued with the enthusiasm of the promoters of foolish designs of locomotive counterbalance which have lately been widely exploited will do well to get a full copy of the paper and read it carefully. They will see why it is a waste of material and money to divide the counterbalance weight into two parts, thereby decreasing the distance of the center of gravity from the wheel center, and they will also see the absurdity of the claim that the magnitude and direction of the resultant forces created by the moving counterbalance depends upon whether the forces are calculated with reference to the trochoidal path or to the circular path about the center of the wheel. In other words, a locomotive that is in perfect counterbalance when run upon a stationary plant, is likewise in perfect counterbalance when run upon the track.

Locomotives are usually balanced to please the engineer and not the track and bridge departments. That is to say, a greater effort is made to reduce the oscillations due to the inertia of the reciprocating parts than to reduce the "hammer blow" upon the rails. The character of the forces is such that it is impossible to perfectly balance a locomotive both vertically and horizontally by rotating weights in the driving wheels. If the engine is balanced so as to entirely eliminate the "hammer blow" or vertical disturbances, then the reciprocating weights are under balanced, and disagreeable oscillations are set up in the locomotive and train. If the reciprocating weights are perfectly balanced, then the vertical disturbing forces are over balanced and severe "hammer blows" are dealt the track at every revolution. Cases are numerous in which rails have been bent by the "hammer blow." Those who have ever ridden on a locomotive, running at high speed over a long span steel bridge, will not have failed to note the peculiar vertical oscillations corresponding in period to each complete revolution of the drivers. When the speed is such that the interval between each hammer blow coincides with or is a multiple of the natural time of vibration of the structure, the stresses set up in the members of the bridge may be excessive. It is for this same reason that a company of soldiers is given the order to break step in crossing a bridge. In practice, the vertical forces are entirely balanced, and from one-half to two-thirds of the reciprocating weights are balanced—the excess weight for balancing the reciprocating weights being divided between the several drivers. A compromise of this sort is obviously necessary, and the question may be asked why it is, then, that accurate formulae should be used in figuring the counterbalance weight?

This subject has been discussed several times by the Master Mechanics' Association. It is common practice to consider two-thirds of the weight of the main rod as revolving weight and one-third of the weight as reciprocating, although this practice is by no means uniform. "Figure a little and guess a little" is the method employed by one Master Mechanic, and primitive as the rule may seem, the results obtained may be as near correct as those obtained by the empirical formulae laid down by the Association. No fault is to be found with the rule that only part of the horizontal forces should be balanced, but the empirical formulae do not give any assurance that the forces are actually balanced as desired. Mr. Parke's formulae are correct, exceedingly simple and involve only the weights of the parts to be balanced, the general dimensions of the rod, the radius of the crank, the distance from the center of gravity of the counterweight from the center of the wheel and the time of vibration of the rod when suspended from knife edges coincident with the center of the cross head pin. All these factors are easily determined.

The Future of the Trusts.

During the decline in price of industrial stocks, there has been suggestion that the combinations will ultimately be split up into their constituent parts. Nevertheless there is evidence that the late changes in the nature of the proprietorship and administration of the industries of the country are to be, in general, permanent. There may be rumor that the control of the United States Steel Corporation has passed to the Rockefeller interest, or that in time through foreclosure it may come into the hands of Mr. Carnegie, but few believe that the one hundred and one firms and companies which participated in the various combinations that culminated in the United States Steel Corporation will ever again own and administer their several plants. It is therefore important to consider whether through combination will be attained economy of production and the most efficient administration, or whether it is a fact that combination leads to wasteful if not corrupt administration, to persistence in financial obliquity, to loss, both to the security holder and to the consumer of products. In favor of the latter view there have been some concrete illustrations in recent experience.

That by control of the sources of supply or by purchase in large quantities, raw material can be obtained more cheaply; that when the services of able managers and of expert specialists are applied to a number of establishments the processes of production can be reduced to the lowest cost; that a saving can be effected through a decreased need for clerks and salesmen are statements that can readily be substantiated on theoretical grounds. Does the experience of the past few years prove that this theory can never be borne out in practice, or is the fact that in numerous cases it has not been borne out an evidence that human nature has fallen short of possibilities to which it can and must be made to rise?

Reassurance may be found in the progress in many fields of human endeavor. For centuries the rascality of guardians, administrators and other trustees under the law, baffled the attempts of the British jurists; but, beginning with the system of jurisdiction and jurisprudence organized by the Earl of Nottingham, such rascality diminished. There was even a time when the priest appropriated the votive offerings to riotous living, and in feudal times the baron was principally engaged in feathering his own nest, having little regard for the comfort of his fief; but now in the machinery of civilized governments the pilferer is an exception.

From the development of the American railroads which are closely akin, although not classed among, the industrials, there may be drawn what perhaps will prove a close parallel. In 1868, when the nation had at last caught its breath, the railroads of the country aggregated about 42,000 miles. In the next four years this mileage was increased by more than one-half. Railroad securities of all kinds were swallowed both in this country and Europe with an avidity which led Mr. Jay Gould to remark, as he kept the printing press busy grinding out the Erie debentures which found a ready and apparently unlimited market, that "The people are very partial to bonds." Based on the railroads that were built, not only in the regions where there was some near prospect of paying traffic, but across the reaches of the prairies and through the western wilds, a tremendous floating was turned into fixed capital. The land of the eagle and the greenback was having a boom.

Toward the close of 1872 it began to be realized that railroad building was going at a too lively pace and a halt was called. The drift of opinion seemed to be, however, that there need be no serious apprehension; that, although zeal might have outstepped discretion, still the country was growing and would soon overtake the railroads which anticipated that growth. Within a year from this time the failures of Jay Cook & Company and of Fisk & Hatch were followed by the collapse of many banking and mercantile establishments throughout the country. In October, 1873, about 10 per cent. of the total railroad bond issue of about $1,700,000,000 defaulted interest. In October, 1874, 108 railroads defaulted on $497,807,660. By February, 1875, 122 railroads had defaulted on $567,028,639, and by January, 1876—out of the total bond issue of about $2,000,000,000—196 railroads had defaulted on $783,967,665.

Then began another period, the first six months of 1877 witnessing the foreclosure of 2,586 miles of railroad with bonds of 78 millions and capital stock of 50 millions, and the passing into receivership of 2,423 miles with bonds of 81 millions and capital stock of 88 millions. It is needless, for the present purpose, to recall the incidents of the period of reorganization that extended well into the eighties, save to point out that with rare exception the large railroad systems did not disintegrate, that the tendency toward combination became greater instead of less. In the meantime the investing public had begun to give railroad bonds a scrutiny that reached beyond their excellence as products of the engravers' and the printers' art, for they had learned that it was not the issuer but the purchaser of a bond that takes the risk. The

water had practically been squeezed out of the securities of important railroads.

In the administration of the railroads there was also gradually coming about a change that was not the least important phase of the new era. The need for economy in operation substituted for the buccaneer the attentive manager; for the free and easy rule of a Jim Fisk, a discipline that is more and more like that of a well ordered army. In short, in the development of the American railroads, men now in middle age have seen the transition from a period of the wildest inflation, of villainous financial procedure and administration so generally corrupt that it was taken almost as a matter of course that an official's first use of his position would be for private gain, to an era of financial method that on the whole is measurably sound, and of administration marked by the zealous devotion of trained and intelligent men to the welfare of the interests entrusted to their care, men who are often without private fortunes and whose salaries are relatively moderate. And the sum of the results is that America leads the world in cheap freight and passenger transportation.

Often of late it has been predicted that a number of the recent industrial combinations are fated to undergo financial reorganization similar to that of the railroads less than a generation ago. Bearing upon such prophecies, it may be stated that, according to the United States census, the entire manufacturing capital of the United States in 1850 was $533,000,000, and in 1890, $6,500,000,000. Compare this with the fact that the capital and funded debt of the manufacturing, mining, real estate and commercial companies organized from 1899 to 1903, inclusive, exceeded $5,500,000,000.

It is not the purpose to push the parallel too far nor to indulge in gloomy predictions. Indisputably there are elements of strength in the financial condition of the country at this time that were not present at any previous period of depression, and no one believes more sincerely than the *Railroad Gazette* that we shall buoyantly ride the highest wave in our course. Attention therefore is directed to the obvious points of resemblance between the period of railroad inflation of thirty years ago and the period of industrial inflation which we have had, while emphasis is laid upon the belief that through such reorganization as the industrials are fated to undergo, there will be brought to their control men of ability and training, men like those servants of the railroads whose zeal and achievement have been silhouetted while "captains of industry," our Belshazzars of fleeting reign, have been glowing in the lime light. There are indeed indications of such a transition.

The faithful officer, the man who works solely for the interests of the security holders and the public, has not the time for scheming in his own behalf, nor has he the temperament of the grabber. At the time of a radical change in the social structure whose results are not yet understood, it is natural that the imaginative promoters, those who have the keenness to see and hands to grab, should come into an ascendancy which must wane when their game becomes generally understood. It is undeniable that in our past orgy men came to industrial control who are unfit for the grave responsibility which it entails, but since, in transportation the highest standard of administration is a visible goal, are we not warranted in the belief that similar progress will be made in the industries?

November Accidents.

The condensed record of the principal train accidents which occurred in the United States in the month of November, printed in another column, contains accounts of 27 collisions, 27 derailments, and two other accidents. Those which were most serious, or which are of special interest by reason of their causes or attending circumstances, occurred as follows:

	Killed.	Injured.
†2d—Foristell, Mo.	2	5
*12th—New Hope, Ky.....	7	1
*†14th—Kentwood, La.	19	28
16th—Philson, Pa.	2	..
19th—Tremont, Ill.	16	18
21st—Gwynedd, Pa.	2	9

When 35 persons are killed in two train accidents within a single month, one naturally expects to see a good deal of notice of the fact in the newspapers; but there has been but little discussion of the two cases in the foregoing list, Kentwood and Tremont, which make up a record of that magnitude. No amount of discussion, however, would make the lessons of these collisions any plainer; nor would discussion act as a preventive of such disasters, unless it led to the adoption of means already well known. The accounts which we publish are, indeed, brief and inadequate; but what will it profit us to know more? The names of the culpable conductors, enginemen or flagmen would do no good, for even if these men were tried for manslaughter nothing instructive would come of it. If the reader looks upon this view as undue pessimism, let him cite a case where a trial has ever produced any appreciable result except to intensify the already poignant anguish of the negligent man. If we knew more in detail the nature of the errors committed at Kentwood and Tremont the only comment—the obvious comment—is to point to similar faults on numerous occasions in the past, which have never anywhere been cured except by the introduction of the block system. In short the lessons of experience are now so clear that collisions like these can only be characterized as due to sinning against light.

The malicious derailment at Gwynedd, Pa., is, perhaps, no more startling than others recorded nearly every month; but it is noteworthy as occurring almost within the bounds of a city of a million people.

The number of electric car accidents reported in the newspapers in November was 10, in which 12 persons were killed or fatally injured, and 58 were less severely hurt. In this total we include a rear collision of electric trains on the elevated road in Brooklyn, N. Y., on the 19th, which was followed by a fire, apparently due to short circuiting of the power current, in which the conductor and motorman were burned to death. It was said that the motorman was imprisoned in his cab, after being probably slightly injured, while the conductor was caught because he entered the burning car after the collision in the hope of being able to avert or mitigate danger by turning off the power current. One of the accidents in the record, in which two persons were killed, was due to the trolley of a street car coming off the wire while the car was on a railroad crossing and a locomotive was rapidly approaching. A collision near Erie, Pa., resulting in seven or more fatal injuries, was due to a gravel car escaping control and running out of a side track on to the main line in the face of an approaching car.

When the Bridgeport improvements of the New York, New Haven & Hartford are completed, involving line straightening, track elevation through the city, a new rolling-lift bridge and a new station, the next important work undertaken will be to increase the capacity of several large bridges, notably at the crossing of the Housatonic, at Cos Cob, Saugatuck, the Connecticut River and the Thames. The bridges named are old. The present bridge limitations of loads on the main line between New York and Boston prevent the running of locomotives weighing more than 157,000 lbs., and it is not considered safe to run loaded cars of 100,000 lbs. capacity. The allowable loads of both locomotives and loaded cars on many of the branches are much less, and in many cases are such as make the operation of the branches complicated and unduly expensive. It is not to be expected that the present minimum schedule of five hours between New York and Boston will not be reduced to any important extent until the use of heavier locomotives is possible, and these slow-order bridges are done away with. The present plan of the company is to four-track the bridges at the Housatonic River, Cos Cob and Saugatuck, to double-track the bridge over the Connecticut River, and provide a four-track masonry structure, and, for the present, merely to strengthen the Thames bridge, at New London. The Cos Cob bridge will receive attention first, and the others will be taken up in rotation. The existence of certain weak and small bridges with an otherwise gilt-edge roadbed has been a rather unaccountable anomaly on the New Haven road for several years.

NEW PUBLICATIONS.

Fowler's Electrical Engineers' Year Book. 1904. Published by the Scientific Publishing Company, Manchester, England. Pocket size, 539 pages, bound in imitation leather. Price 1s. 9d., probably costing an American buyer about 75 cents, including duty and express.

This valuable little book has been brought up to date by the addition of the Institution of Electrical Engineers' revised general rules for wiring, and the Board of Trade regulations and statutory rules relating to tramways, light railroads and electric lighting. Many sections have been rewritten, as, for instance, the sections on measuring instruments, electric distribution, meters and dynamos. New matter on polyphase transmission and induction motors has been included. The directory of electric light, power and traction stations of the United Kingdom, which has been a feature of the book, has been overhauled and the particulars of over 500 installations are given. The book is primarily adapted to the use of British engineers but it is also of value to those who may have frequent need of a ready reference to subjects and principles pertaining to the electrical art.

TRADE CATALOGUES.

The Q and C-Bonzano Rail Joint sold by the Railway Appliances Co., Chicago, is described in Catalogue No. 107, recently issued by that company. A number of designs of this rail joint applied to standard sections of T and girder rails with plain and insulated joints are illustrated together with plotted deflection tests of a 100-lb. rail, the Bonzano joint and the ordinary angle bar joint. What the joint is, how it is made and what it will do when placed in the track, are briefly stated. The Bonzano joint is in use on 2,000 miles of track in the United States and Canada, and has been on the market five years, so that it has passed the experimental stage and its merits are being demonstrated in practice.

The Seaboard Air Line has issued, in handsome style, a little book of 30 pages entitled "A Bride and a Bridle," by Julian Street and Frank Finney. The book contains two tales, one of which is a genuine love story, with backhand complimentary references to the railroad, and the other is genuine advertising with backhand references to the love story. The book is illustrated with eight full-page wash drawings which are well done. The Passenger Department of the railroad, Portsmouth, Va., may be addressed.

The Newton Machine Tool Works, Philadelphia, describes its designs of rotary planing machines in catalogue No. 37. The machines are built in 11 sizes with heads from 14 in. to 84 in. in diameter over tools. The machines are built either fixed, portable or on a round base and either belt or motor driven.

The New Colburn Universal Saw Table is the title of a new catalogue of the Colburn Machine Tool Company, Franklin, Pa., which has recently built a new plant. The illustrations are excellent and the descriptions are complete. The many operations possible with this saw table are well shown.

Compound Couplers for locomotive and special use is the title of a catalogue of the Washburn Company, Minneapolis, Minn. These couplers have flexible heads but are built with a back plate instead of a long shank. The details of the several designs are illustrated by good wash drawings.

Dodge & Day, Modernizing Engineers, Nicetown, Philadelphia, give some interesting facts concerning shop management in a recent publication entitled "Betterment Reports." The character of the reports made by this firm in investigating shop methods are described in detail.

Kingsford Pumps are described in a catalogue recently got out by the Kingsford Foundry & Machine Works, Oswego, N. Y. The pumps are the centrifugal type and are built for dredging, circulating, paper and sulphite mills, deep wells, etc.

The Buffalo Forge Company, Buffalo, N. Y., has issued two new catalogues. The first describes the forms of "Buffalo" improved ventilators and the second catalogue deals with "Buffalo" disk wheels and their varied forms and applications.

Some interesting facts about colors and specifications are given in a little folder lately issued by the *Joseph Dixon Crucible Company*, Jersey City, N. J.

Annual Report of Interstate Commerce Commission.

The Interstate Commerce Commission has issued a synopsis of its 17th annual report which has just been sent to Congress. Following are extracts.

The preliminary income account for the year ending June 30, 1903, shows, on 201,457 miles of railroad (98 per cent. of the entire mileage) gross earnings of $1,890,150,679, or $9,382 per mile of line. Operating expenses aggregated $1,248,520,483, or $6,197 per mile, leaving net earnings of $641,630,196, or $3,185 per mile. Fifty-three million dollars in taxes are not included in this statement of operating expenses. Compared with the previous year the net earnings are greater by some 34 millions and stock dividends are greater by nearly 10 millions. In 1897 the gross earnings averaged only $6,122 and operating expenses $4,106 per mile of line.

The legislation passed by the last Congress, commonly known as the Elkins law, is discussed. It is believed that much benefit will result from the fact that proceedings can now be taken against the corporation, as well as against agents. This amendment abolished the penalty of imprisonment; whether the good results claimed for this change will be realized is by no means certain.

Another and more essential provision in the amended statute is the one which confers jurisdiction upon the circuit courts of the United States to restrain departure from published rates, or "any discrimination forbidden by law," by writ of injunction or other appropriate process.

The Commission feels warranted in saying that the beneficial bearing of this amendatory legislation became evident from the time of its passage, and that it has proved a wise and salutary enactment. It has corrected serious defects in the original law and greatly aided the attainment of some of the purposes for which that law was enacted. It is believed that never before in the railroad history of this country have tariff rates been so well or generally observed as they are at the present time. Other things, however, have contributed to the improved conditions now prevailing, and among them is the great increase in traffic, which, in most parts of the country, continues to move in unprecedented volume. The test of the law will come when a lessened volume of competitive traffic invites sharp contest for business.

The Commission does not mean to say, however, that preferences are no longer secured of the nature which the recent law aims to prevent. Tariffs as published and filed are now generally observed, but in some cases the tariffs themselves are so framed and contain such provisions as to permit preferences without departing from their terms, and some illustrations are given. The tariffs are not departed from in such cases, but the things which can be done in accordance with the tariff may be equivalent to the payment of a rebate. The letter of the law is observed, but its purpose may be disregarded. The circumstance that such discriminations occur does not detract from the excellence of the measure in question. The amended law appears to be efficient and workable, and gratifying progress has already been made in the

publication of tariffs and in the observance of the rates thereby announced.

Valuable as the amendment is, it has added nothing whatever to the power of the Commission to correct a tariff rate which is unreasonably high or which operates with discriminating effect. This is the point to which the attention of Congress has been repeatedly called; this is a defect in the regulating statute which demands attention. In previous reports the Commission has pointed out the amendments deemed essential and its duty in this regard has been performed.

The Elkins amendment has brought about in many cases an increase of railroad charges, and, as a result of the maintenance of rates, has operated to intensify whatever was wrong in the tariffs themselves. This is doubtless one explanation of the marked increase in the number of formal complaints made to the Commission during the present year, which are more than double those of the previous year and more than four times the number of those received the year before. The fact that such complaints multiply is highly significant. But the only order which the Commission has power to make is the limited and inconclusive order to "cease and desist" from charging the rates found to be unlawful; and even that order has no binding force upon the carrier, until compliance is decreed by the courts at the end of tedious and expensive litigation.

Advances in Freight Rates.—One of the most significant things in the past three years has been the marked and general advance in rates. Six years ago railroad witnesses often insisted that railroad rates could not be advanced, but the history of the last three years has discredited these predictions. These advances in transportation charges have accrued principally through increase of the published rate itself. Such increase applies in almost all sections of the country and to many of the most important kinds of traffic. With some exceptions, class rates have not been increased. There have been actual increases in rates upon those commodities constituting the bulk of railroad traffic, such as coal, grain, lumber, live stock, dressed meats, and packing-house products. An exception in the case of packing-house products from Missouri River points to Chicago is noted. Many advances have been worked by changes in classifications. The effect of these advances has been to correspondingly increase the tax laid upon the general body of producers and consumers in this country for the benefit of the owners of railroad property. These advances have been usually, if not always, the result of concerted action by the carriers. It is idle to say that where such a condition exists there has not been an understanding between the carriers. The theory of our law has been that competition between different carriers would prevent unreasonable advances and secure reasonable rates.

Without expressing an opinion as to whether the action of these carriers has amounted to violation of law—and they insist that it has not—the Commission desires to point out the fact that such concert of action does prevail as practically eliminates all competition in the tariff rate. The requirement of the law that carriers shall compete affords no protection to the public

It has been frequently said that the adjustment of freight rates is a delicate commercial proposition, which could only be dealt with by people having a most intimate knowledge of conditions and could not be revised by any outside body. The advances in the last three years have not been made upon that theory. They have not originated with the traffic representatives of the various systems, but rather with the financial heads. Railroads ought to share in the general prosperity, and in some respects the cost of operation has very materially advanced. On the other hand, many economies in the way of railroad operation have been introduced, and the great increase in the amount of traffic has enabled railroads to handle it cheaper in proportion. A table is given showing the gross and net earnings per mile of all railroads in the United States since 1897.

The Commission sees no assurance of a corresponding decline in rates in the future. It is hardly conceivable that if traffic were to fall off the carriers would for that reason reduce their rates. Relative rules have been pretty thoroughly adjusted between all parts of the country, and the unification of railroad property is such that to-day it is an easy matter to prevent a decrease in rates, except on isolated commodities. It is impossible to contemplate with indifference the fact that the result of all the recent improvements in transportation facilities is an increase in the transportation charge, or to remember with indifference that this species of property now possesses the power to tax unjustly every other species of property.

Some interstate carriers have refused to furnish in their annual reports information required by the Commission. As information of this kind becomes more and more important there is an inevitable tendency to refuse its production. The Commission recommends that a penalty be provided for failure to file such reports or furnish information therein as required by the Commission.

Concessions to Favored Shippers.—While rates have been generally maintained new expedients are found for the purpose of favoring particular shippers. The salt industry in Kansas is carried on by the Hutchinson-Kansas Salt Company, and by independent operators. Salt rates from Hutchinson to the Missouri River were not generally maintained previous to the spring of 1902, but since that time tariff rates have been charged. The Santa Fe, Missouri Pacific, and Rock Island systems, all having lines leading from Hutchinson, made joint tariffs with the Hutchinson and Arkansas River Railroad Company on salt to Missouri River points. This Hutchinson & Arkansas River Railroad Company, while incorporated, does not operate any railroad or own any equipment, but it does own some sidings adjacent to what is known as the Morton Mill, owned by the Kansas Salt Company. This railroad company received under the joint tariffs 25 per cent. of the rates, but not exceeding 50 cents per ton. The persons who control this railroad company are those in control of the so-called salt trust, and they receive the benefit of the division accorded to the Hutchinson & Arkansas River Railroad.

It was testified that 50 cents a ton represented a fair profit to the producer, and that the trust was selling salt under contract at the Missouri River at a price with which the independent operators could not compete. This price drove the independent operator out of that business, and it would not have been made had not this division been given to the Hutchinson & Arkansas River Railroad Company.

Devices of this nature are frequently resorted to. If the present law is not sufficient to reach a case of this sort, it is evident that some amendment should be secured which will; for if carriers are free to make contracts and divisions of this nature it is evident that they may prefer at their option one manufacturer to another.

Private Car Evil.—The Commission refers again to the evils resulting from excessive payments by railroad companies for the use of private cars, particularly those owned and controlled by shippers. That the earnings of shippers' cars of the refrigerator type are grossly excessive is generally believed. The Commission repeats the opinion that the private ownership of cars by shippers, or by outside concerns which furnish them to shippers, is wrong in principle, and recommends that the payment of car mileage for the use of private cars be regulated.

Valuation of Railroads.—There should be a trustworthy valuation of railroad property in the United States, as the judicial rules for the determination of reasonable rates for freight and passenger traffic lay stress upon the fair value of the roads whose rates are the subject of complaint. Closely connected with the question of reasonable rates is the question of reasonable taxation. The Commission recommends that Congress take this matter under advisement. Of the various methods of valuing railroad property, the one which seems to meet most nearly the necessities of the situation calls for a complete and detailed inventory of both physical and non-physical values. Salient features of the several methods are discussed in the report.

Employment of Special Attorneys.—The Commission has several times assigned its attorney to appear for the complainant in cases where formal complaint has been made by private shippers or public associations, and this has been made the subject of some criticism. . . . We cannot say to a complainant, "Employ your attorney, file your complaint, produce your proofs, state your claims, and we will decide the issue." Shippers could not and will not be to the expense of prosecuting complaints before the Commission ordinarily under those conditions, nor should they be required to do so. The investigation is for the public benefit and may properly be made at the public expense. Whenever a complaint involves a question of general application, either as to the unreasonableness of a rate or the existence of some discriminating practice, we deem it our duty to investigate that matter without undue expense to the one making the complaint. A most expeditious method is to proceed in a pending case by appointing some one to appear at the expense of the Government in the public interest.

Work of the Operating Division.—Attention is called to the great increase of work in this division, which has resulted from the greater number of complaints, large additions to the correspondence files, the necessity of sending out circulars in relation to important subjects under investigation, the work occasioned by compliance with resolutions of the Senate of the United States directing special investigations and reports, the inspection of railroad equipment with reference to the enforcement of the safety appliance law, and the collection, tabulation, and publication of statistics secured in monthly reports of accidents.

Complaints.—Since the last report 544 cases have been presented to the Commission. The number of contested cases and investigations instituted for the year was 82, and these involved directly the rights and practices of 296 carriers. The number of these cases in 1902 was 38, and in 1901 it was 19.

Decisions.—The cases in which decisions were filed involved the following subjects: Advances in freight rates from the Mississippi River to the Atlantic seaboard: greater charges for shorter than for longer distances; freight classification; application of carload rates to combined shipments; stop-over privilege on shipments of grain; passenger fares; reparation; and extensions of time to comply with the safety-appliance act.

Court Decisions.—One court decision was rendered during the year, continuing the temporary injunctions granted in 1902 by the court in Chicago, restraining carriers leading easterly to the Atlantic seaboard from departing from their published tariff rates. The temporary injunctions granted by the circuit court at Kansas City about the same time have also been continued in force. Another injunction case under the Elkins law involved the transportation of coal from West Virginia mines to Newport News, Va., and in that case a temporary injunction, restraining the carrier from departing from its published tariff rates on coal and other traffic, was granted. Five court decisions have been rendered during the year in cases involving enforcement of orders issued by the Commission. These are known as the Orange Routing Case, in which the circuit court for the southern district of California overruled demurrers to the petition of the Commission; the Lagrange, Ga., Long and Short Haul Case, decided adversely to the Commission by the United States Supreme Court; the Hampton, Fla., and Danville, Va., Long and Short Haul Cases, decided in favor of the carriers; and the Wilmington, N. C., case, relating to rates and traffic from western points to Wilmington, as compared with those to Norfolk and other Virginia cities, which was also decided in favor of the defendant. In another case, brought to compel testimony and the production of documents before the Commission, the court held that the testimony and documents were not material or relevant to the matters in issue before the Commission, but the case is now pending on appeal in the United States Supreme Court.

Other court decisions are discussed in the report under the heading of: "Injunction restraining the taking effect of advances in lumber rates," "Apportionment of railroad cars to competing coal mines," "Transportation beginning and ending in one State but passing through another," "Power of Congress to regulate interstate commerce," "Government-aided railroad and telegraph lines." The report contains a list of 30 civil cases pending in the courts, including eight cases to enforce orders of the Commission; a contempt proceeding for alleged failure to obey a decree of the circuit court enforcing an order of the Commission; one proceeding to enforce the safety-appliance act; four mandamus cases to compel the filing of annual reports with the Commission, and one case involving construction of the safety-appliance law in which the United States intervened upon request of the Commission. A number of other cases are about to be brought to enforce compliance with the safety-appliance law. Four criminal proceedings are also described. The Attorney-General has promptly and cheerfully complied with every request for the prosecution of civil and criminal proceedings, and has in various ways materially aided the efforts of the Commission to enforce the regulating statutes.

Safety Appliance Law.—Since the last annual report of the Commission the safety appliance law has been amended in important particulars by an amendment approved March 2, 1903. This requires a fixed minimum of 50 per cent. of cars properly equipped with air-brakes in working condition to be placed in each train. The necessity of showing that a car was engaged in interstate commerce, a matter of great difficulty in many cases, has been obviated by this amendment, as the act now covers "all trains, locomotives, tenders, cars, and similar vehicles used on any railroad engaged in interstate commerce." The railroads have had 10 years to place their equipment in condition to meet the requirements of the law, and it is time it was complied with in every detail. The Commission has lodged information with the district attorneys of violations of the act by the Denver & Rio Grande; Chicago, Rock Island & Pacific; Wabash; Gulf, Colorado & Santa Fe; Southern; Wisconsin Central; Texas & New Orleans; Chicago, Milwaukee & St. Paul; Terminal Railroad Association of St. Louis; Wiggins Ferry Company, and Illinois Central. The Commission has also requested the proper district attorneys to proceed against the following roads for failure to comply with the law relating to reports of accidents: Chicago, Rock Island & Pacific; Wabash; Chicago Great Western, and the Lehigh Valley.

Reference is made to the extensions of time recently granted in connection with this year's amendment to the Safety Appliance Law. These matters are already familiar to readers of the *Railroad Gazette.*

The inspection service might be made more effective if the inspectors were authorized to mark every car which they found defective, or had authority, suitably restricted, to prevent the running of trains not having the required percentage of air-brakes or otherwise palpably in violation of the act. The general condition of the freight cars and engines of the country, in respect to couplers and power-brakes and hand holds, is not so good as it was last year. The number of air-brakes used is slowly increasing, and many freight trains are now run with 70 to 90 per cent. of their cars air-braked and the brakes in service. In a great many trains in the fast-freight service and in some ordinary freight trains all of the cars —100 per cent.—are air-braked. This might be true much oftener than it is but for the lack of care and forethought on the part of the officers in immediate charge of train movements. There is now a larger number of testing plants in freight yards where trains are made up than there was a year ago. The preservation of couplers in good condition and the consequent promotion of safety has been promoted materially by the adoption on some roads of a rule requiring that heavy cars be placed in the forward parts of trains.

Accident Reports.—With the end of the month of June last the reports which are made to the Commission by the railroads under the accident law of March 3, 1901, completed a two years' record, and the totals of the principal items in these reports are given in the appendix.* The number of employees killed and injured in coupling and uncoupling cars has increased by a very large per-

*The Accident Bulletins have been regularly published in the *Railroad Gazette.*

centage. . . . It is gratifying to note that the list of fatal accidents to passengers in train accidents is no larger than last year. The report calls attention to the fact that certain disastrous collisions have been occasioned by the misconduct or negligence of telegraph operators or signalmen under 21 years of age, and says that Congress might well consider the propriety of a statute making it unlawful for any person under 21 years of age to act as telegraph operator (to perform the duties referred to) or as block signalman.

A good deal of correspondence has been necessary to secure the prompt filing of accident reports, and the cases of two or three roads have been referred to the proper district attorney for prosecution.

The Commission compares the railroad companies' accident reports with such information concerning deaths and injuries as it receives from other sources, and notifies the railroads of their delinquencies. As employees have no voice in reporting the causes of accidents and the circumstances connected with them, there may be cases where they are reflected upon more strongly than would be the case were the reports made by a disinterested person. In this connection it should be noted that coroners' juries in their verdicts frequently reach very different conclusions as to the causes of and responsibility for accidents than are given by the railroad companies in their reports to the Commission.

Collisions—the Block System.—The most prominent fact in this year's record of train accidents is the appalling loss of life and property in collisions, and the showing is a disgrace to the American people, painful to every careful observer. That 130, or 118, or any large number of passengers are killed in the United States in the course of a year in a single class of accidents indicates a condition which should not pass without serious attention. These fatalities are due to causes which have never been adequately considered by any department of government, either of the United States or of any of the States, and there is a crying need for such consideration.

That many railroads have equipped some of their lines with block signals, a measure which greatly reduces the chances of collisions, is a gratifying fact, . . . but there occurred in the United States in the year under review an enormous number of collisions, 5,219, and (included in these) 10 collisions in each of which seven or more persons were killed (104 persons in the 10 cases).

So far as we can see, the best thing to do is to introduce the block system. That is what England has done, and the immunity from collisions on English railroads is so nearly complete, and the casualty records so low, as to be a powerful argument for its adoption. The Commission therefore recommends the consideration of a law like that in force in Great Britain and Ireland, requiring the adoption and use of the block system in the United States, unless some better device can be secured. A tentative draft of a bill for that purpose is given in the appendix. In this proposed bill it is proposed that each railroad company be required to adopt a block system on one-fourth of its passenger lines by Jan. 1, 1906; on another fourth by Jan. 1, 1907; another fourth one year later, and on the whole by Jan. 1, 1909. Many of the principal lines would be required to make no important additions to their expense accounts for the first two years, and some would feel no burden for the first three years. For the purpose of dealing with separate parts of an extensive system of railroads a section has been included, enabling the Commission to deal with one part of a company's lines independent of the other parts.

In view of the frequency of startling accounts of railroad disasters that have been laid before the public in the newspapers within the last few months, there can scarcely be need of argument. If any argument is needed in favor of the proposition to take legislative action looking to the prevention of these horrible disasters, it can be found in the action already taken by the majority of the principal railroads of the country that have used the block system on their chief lines for years. One prominent company, which has used the block system for more than 25 years, is now spending many thousands of dollars annually in improving and extending its block-signal appliances; and the importance of this feature of railroad operation is indicated by the large appropriations which the most enterprising companies make for scientific and vigilant oversight of their signaling plants.

The report says that defects in the ordinary methods of managing trains must be looked upon as incurable. Either from ineradicable mental infirmities in men of the most competent class, or from the employment of men more or less incompetent, collisions, due to blunders and forgetfulness, usually of two or more men simultaneously, follow one another in endless and rapid succession. Only about one-seventh of the railroad mileage of the country is worked by the block system, and the strong arm of governmental authority is needed to arouse those companies which have not taken action, or which have made progress so slowly that they are chargeable with neglect of a plain duty to the public. The proposed act, or some measure of similar character, is therefore earnestly recommended to the attention of the Congress.

Statistics.—During the past year the statistician has issued a 40-year review of changes in freight tariffs, a 12-year review of State railroad regulation, and a compilation of statutes relative to railroad taxation.

Wabash Atlantic-Type Locomotives.

The Wabash is receiving some new Atlantic-type (4-4-2) locomotives from the Brooks Works of the American Locomotive Company for use in fast passenger service. A photograph of one of these engines is shown herewith. The driving wheels are 83 in. in diameter and the cylinders are 21 in. x 26 in. With the working pressure of 200 lbs. the maximum tractive effort is 23,500 lbs. All the wheels have brake-shoes.

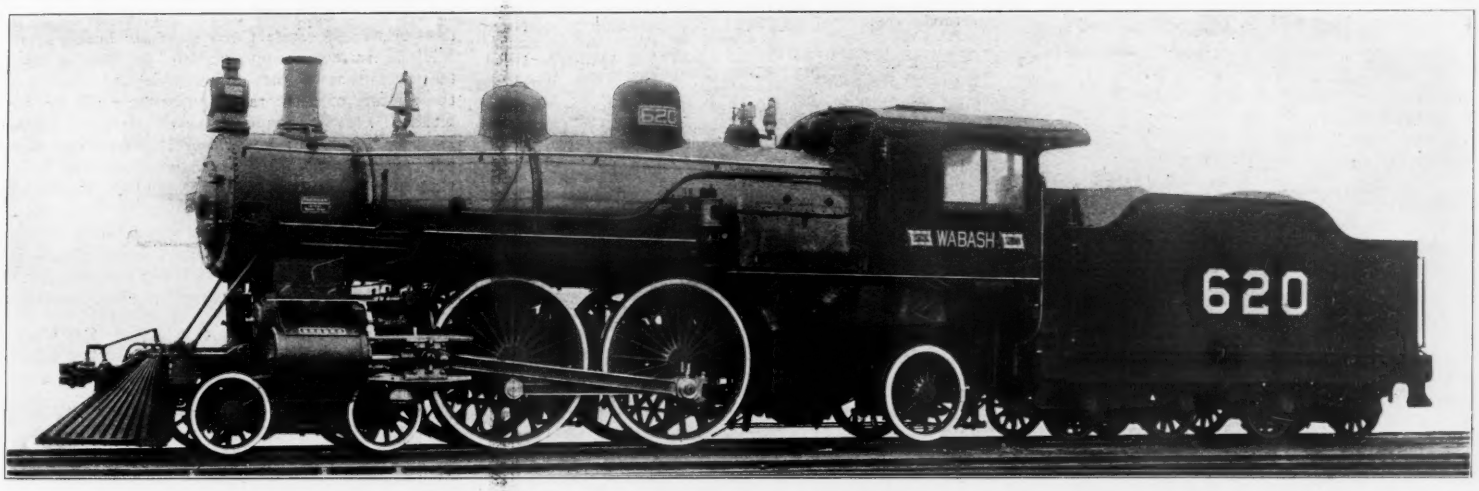
Some of the typical ratios follow:

Weight on drivers divided by maximum tractive effort	4.12
Weight on drivers divided by heating surface	36.2
Heating surface divided by grate area	61.2
Fire-box heating surface divided by total htg. surface	6.62
Steaming capacity*	.133

*See *Railroad Gazette* June 19, 1903, for steaming capacity formula.

A general description follows:

Kind of coal to be used	Bituminous
Weight on drivers	96,700 lbs.
Weight, total	180,700 lbs.
Weight, tender empty	55,460 lbs.
General Dimensions.	
Wheel-base, total, of engine	30 ft. 11½ in.
Wheel-base, driving	7 ft. 6 in.
Wheel-base, total (engine and tender)	56 ft. 0 in.
Height of stack above rail	15 ft. 3 in.
Heating surface, fire-box	177 sq. ft.
Heating surface, tubes	2,499 sq. ft.
Heating surface, total	2,676 sq. ft.
Grate area	43.7 sq. ft.
Wheels and Journals.	
Drivers, number	4
Drivers, diameter	83 in.
Drivers, material of centers	Cast steel
Truck wheels, diameter	36 in.
Journals, driving axle, size	9½ in. x 12 in.
Journals, truck axle, size	6 in. x 12 in.
Main crank pin, size	6½ in. x 6½ in.
Cylinders.	
Cylinders, diameter	21 in.
Piston, stroke	26 in.
Piston rod, diameter	3¾ in.
Kind of piston rod packing	Snap rings
Steam ports	1¾ in. x 25½ in.
Exhaust ports	65 sq. in.
Bridge, width	3½ in.
Valves.	
Kind of	Piston
Greatest travel	5 9/16 in.
Outside lap	1¼ in.
Inside lap	0 in.
Lead in full gear	1/16 in.
Boiler.	
Type of	Radial stayed wagon-top
Working steam pressure	200 lbs
Material in barrel	Otis steel
Thickness of material in barrel	11/16 in.
Diameter of barrel	64¼ in.
Seams, kind of horizontal	Sextuple
Seams, kind of circumferential	Triple
Thickness of tube sheets	½ in.
Thickness of crown sheet	⅜ in.
Fire-box.	
Length	8 ft. 6 in.
Width	5 ft. 3 in.
Depth, front	75½ in.
Depth, back	65½ in.
Material	Carbon acid steel
Thickness of sheets	⅝ in.
Water space, width:	Front, 5 in.; sides, 4½ in.; back, 4½ in.
Grate, kind of	Rocking
Tubes.	
Number	294
Material	Iron, No. 11, B. W. G.
Outside diameter	2 in.
Length over sheets	16 ft. 4 in.
Other Parts.	
Exhaust pipe, single or double	Single
Exhaust nozzle, diameter	5⅛ in.
Stack, straight or taper	Taper
Stack, least diameter	14½ in.
Stack, greatest diameter	16¾ in.
Tender.	
Type	Eight-wheel
Tank capacity	6,000 gal.
Coal capacity	12 tons
Type of underframe	Channels
Type of truck	Cast steel bolsters
Diameter of truck wheels	36 in.
Diameter and length of axle journals	5½ in. x 10 in.



Wabash Atlantic-Type Locomotive.

Train Accidents in the United States in November.[1]

unf, 1st, Kanawha & Michigan, Red House, W. Va., a passenger train was derailed at a point where the track had been distorted by the heat of a burning trestle bridge and the engine and all of the cars were overturned. The engineman was killed and four passengers were injured.

*unf, 1st, 4 a.m., Southern Pacific, Sesma, Cal., passenger train No. 16, first section, broke through a trestle bridge which had been weakened by fire, and the tender, one mail car and one passenger car were wrecked and burnt up. The fireman jumped off and was killed, and two mail clerks were injured.

*rc, 2d, Pennsylvania road, Tyrone, Pa., rear collision of freight trains, making a bad wreck. A moment later a westbound freight train ran into the wreck and all four main tracks were blocked. The wreck was mostly burnt up.

*rc, 2d, 4 a.m., Southern Pacific, Glidden, Texas, a freight train ascending a grade at low speed was run into at the rear by a following freight, wrecking the engine, caboose and two cars. A gasoline stove in the caboose, on which the trainmen were cooking their breakfast, set fire to the wreck and it was burnt up. One trainman was injured.

†rc, 2d. Wabash road, Foristell, Mo., a freight train ran into the rear of a preceding freight, wrecking the caboose and injuring seven drovers, two of them fatally. Seven cars of cattle were wrecked.

dn, 2d, Baltimore & Ohio, Allegheny, Pa., a passenger train was derailed at a misplaced switch and the engineman was killed. There was a dense fog at the time.

unx, 2d, Atchison, Topeka & Santa Fe, Thatcher, Cal., passenger train No. 6 was derailed and the engine was overturned. The fireman was killed.

*bc, 3d, Louisville & Nashville, Shepherdsville, Ky., butting collision of freight trains, wrecking both engines and several cars. The fireman and one brakeman were killed and one other trainman was injured. The wreck was set afire by an explosion of gasoline and was mostly burnt up.

dn, 3d, Georgia Railroad, Dorsey, Ga., a freight train was derailed at a misplaced switch and the engine and several cars were overturned. The fireman and an unknown man were killed and the engineman was injured.

rc, 3d, 11 p.m., Northern Pacific, North Yakima, Wash., rear collision of freight trains, wrecking the caboose and two cars. A boy "beating his way" was killed.

rc, 4th, Southern Railway, Chester, S. C., collision be-

[1]Accidents in which injuries are few or slight and the money loss is apparently small, will as a rule be omitted from this list. The official accident record published by the Interstate Commerce Commission quarterly is regularly reprinted in the *Railroad Gazette*. The classification of the accidents in the present list is indicated by the use of the following

ABBREVIATIONS.

rc	Rear collisions.
bc	Butting collisions.
xc	Miscellaneous collisions.
dr	Derailments; defect of roadway.
eq	Derailments; defect of equipment.
dn	Derailments; negligence in operating.
unf	Derailments; unforeseen obstruction.
unx	Derailments; unexplained.
o	Miscellaneous accidents.

An asterisk at the beginning of a paragraph indicates a wreck wholly or partly destroyed by fire; a dagger indicates an accident causing the death of one or more passengers.

tween a passenger train and a work train; one laborer killed, two passengers and two trainmen injured.

bc, 4th, Cleveland & Pittsburg, New Philadelphia, Ohio, butting collision of freight trains; one engineman and one fireman killed, four persons injured. It is said that there was a mistake in telegraphic orders.

o, 5th, Toledo & Ohio Central, Rendville, Ohio, the locomotive of a passenger train was wrecked by the explosion of its boiler, and the fireman was killed.

eq, 5th, 2 a.m., Southern Railway, Tryon, N. C., the locomotive of a freight train was derailed by the breaking of the flange of a wheel of the tender, and, with the tender and five loaded cars, fell down a high bank. One brakeman was injured.

bc, 5th, Evansville & Terre Haute, Fort Branch, Ind., butting collision of freight trains, wrecking both engines and three cars. Of two men stealing a ride in one of the cars one was killed and the other fatally injured. There was a dense fog at the time.

unx, 7th, Toledo, St. Louis & Western, Frankfort, Ind., a passenger train was derailed and three passenger cars were overturned. Eighteen passengers were injured.

dn, 8th, New York Central & Hudson River, Cayuga, N. Y., the locomotive of a passenger train ran off the end of the track, at a drawbridge which was open, and fell into Seneca canal. The conductor and engineman were slightly injured.

unx, 8th, Columbia & Puget Sound, Black Diamond, Wash., a locomotive and two cars were derailed and overturned. The fireman and one brakeman were killed and the engineer seriously injured.

unf, 9th, West Virginia Central & Pittsburg, Hendricks, W. Va., passenger train No. 1 was derailed by running over a cow, and the engine fell into Blackwater River.

unf, 9th, Yazoo & Mississippi Valley, Natchez, Miss., a special passenger train was derailed at a switch which had been maliciously misplaced. The fireman jumped off and was killed.

rc, 9th, Cleveland, Cincinnati, Chicago & St. Louis, Nokomis, Ill., rear collision of freight trains; engineman killed, fireman injured.

bc, 10th, 9 p.m., Southern Pacific, Visalia, Cal., collision of locomotives in a yard. Two employees and two other trainmen injured, one of the latter fatally.

eq, 11th, Southern Pacific, Vincent, Cal., a freight train was derailed by the breaking of a wheel, and five cars were ditched. A tramp was killed.

rc, 11th, Chesapeake & Ohio, Lewis, W. Va., rear collision of freight trains, wrecking the caboose; a man in the caboose was killed.

eq, 11th, Southern Pacific, Colton, Cal., a freight train was derailed by the breaking of an axle. The train was being pushed by two powerful engines and the cars following the one with the broken axle were pushed violently together; and five tank cars loaded with oil were ditched and broken up.

*bc, 12th, 4 a.m., Louisville & Nashville, New Hope, Ky., butting collision of freight trains, wrecking three engines and many cars. The wreck took fire and was mostly burnt up. Three enginemen and three firemen were killed and two brakemen were injured, one of them fatally. There was a dense fog at the time.

*†rc, 14th, 8 p.m., Illinois Central, Kentwood, La., a passenger train standing at the station was run into at the rear by a following passenger train and two passenger cars were wrecked. Nineteen passengers were killed or fatally injured and 27 passengers and one employee were injured. This collision was reported in the *Railroad Gazette* of Nov. 20 and 27. The collision is attributed to both failure to signal back from the standing train and failure to keep a good lookout on the moving train.

bc, 14th, Pennsylvania road, Bradley Junction, Pa., butting collision of empty engines, due, it is said, to a misunderstanding of orders. One fireman and one brakeman were killed, and three other trainmen were injured.

dn, 14th, 1 a.m., Pennsylvania road, Buffalo, N. Y., the engine of a passenger train was derailed at the derailing switch approaching the drawbridge over Buffalo Creek, and, with one passenger car, fell into the ditch. The engineman was killed and the fireman and three passengers were injured.

dn, 15th, Wheeling & Lake Erie, Kent, Ohio, a passenger train was derailed at a misplaced switch and the engine was ditched. One passenger car was partly overturned; two trainmen were injured.

dn, 16th, Baltimore & Ohio, Philson, Pa., a freight train which became uncontrollable on a descending grade was derailed and two engines and 21 cars were wrecked. One fireman was killed and one engineman fatally injured.

o, 16th, 3 a.m., Great Northern, Williston, N. Dak., a baggage car in passenger train No. 3 was badly damaged by the explosion of its gas tank, and four trainmen were injured. Gas escaping from a ruptured pipe was ignited while the trainmen were attempting to thaw out the steam pipes beneath the car.

dn, 17th, Pennsylvania road, Philadelphia, Pa., a freight train entering a side track was not properly controlled and it broke through the stop at the end of the track. One man was killed and two others were injured.

bc, 18th, Southern Railway, Winston, Va., butting collision between passenger train No. 16 and a freight train, due, it is said, to a misunderstanding of orders. Six trainmen were injured.

bc, 19th, Cleveland, Cincinnati, Chicago & St. Louis, Tremont, Ill., butting collision between a freight train and a work train, making a bad wreck. The boiler of the engine of the work train exploded a moment after the collision. Eight foremen and eight laborers on the work train were killed and four trainmen and 14 laborers were injured. The work train appears to have disregarded a telegraphic order limiting the length of time which it might use on the main track in the face of the freight.

*bc, 19th, Norfolk & Western, Matewan, W. Va., butting collision of freight trains, making a bad wreck. The wreck took fire and was partly burned up. One engineman and one brakeman were killed, and two other trainmen were fatally injured. It is said that the collision was due to a mistake in telegraph orders.

dr, 19th, Texas & Pacific, Mesquite, Texas, a freight train broke through a trestle bridge and 10 cars fell to the stream below. An unknown man was killed.

rc, 21st, Missouri, Kansas & Texas, Forreston, Texas, a freight train standing at a water tank was run into at the rear by a following freight, and the caboose and three cars were wrecked. Two boys riding in a freight car were killed and a fireman was injured.

*rc, 21st, 4 a.m., Central of New Jersey, Elizabeth, N. J., a passenger train ran into the rear of a preceding freight, wrecking the caboose and one mail car, which took fire and were burnt up. The engineman of the passenger train was injured.

eq, 21st, Chicago, Rock Island & Texas, Boyd, Texas, a freight train was derailed by the breaking of a flange and 18 cars were ditched. An unknown man was killed and a brakeman was injured.

†unf, 21st, 11 p.m., Philadelphia & Reading, Gwynedd, Pa., a passenger train consisting of an engine and three cars was derailed at a point where the track had been maliciously loosened, and the last car fell down a bank. The car next to this was pulled part way down. One passenger and the fireman were killed and six passengers and three trainmen were injured. The fireman was smothered to death by water rushing out of the ruptured tender. The joint in the track which had been loosened was on a stone arch bridge, the intention of the wreckers having been, doubtless, to precipitate the train into Wissahickon Creek.

xc, 22d, 11.15 p.m., Pennsylvania road, Broad Street, Philadelphia, an express train leaving the station ran into the side of an accommodation train, partly overturning two passenger cars and slightly injuring five passengers. The two trains started out of the station almost at the same time and it is said that the engineman of the express failed to observe a stop signal which was set against him.

eq, 23d, Cleveland, Cincinnati, Chicago & St. Louis, Fox, Ind., a freight train was derailed by the breaking of a wheel of the engine and the engine and 12 cars were ditched. The engineman was killed.

dn, 23d, Southern Railway, Waynesville, N. C., a freight train which became uncontrollable on a steep descending grade was derailed and wrecked. The engineman and one brakeman were killed and three other trainmen were injured.

unf, 24th, Great Northern, Lanark, Mont., passenger train No. 3 was derailed by running over cattle on the track, and seven cars were ditched. The engineman and fireman were killed.

*rc, 25th, 3 a.m., Illinois Central, Bolivar, Tenn., a freight train drawn by two engines ran into the rear of a preceding freight which had been unexpectedly stopped; and two engines, the caboose and several cars of lumber were badly damaged. The wreck took fire and was mostly burnt up. Two trainmen were injured.

rc, 25th, Illinois Central, Scottsburg, Ky., a freight train ran into the rear of a preceding freight, wrecking several cars. The fireman and one other trainman were injured, the former fatally.

unx, 25th, 4 a.m., Norfolk & Southern, Elizabeth City, N. C., a freight train was derailed on the bridge over Knobbs Creek and a brakeman was thrown into the river and killed.

bc, 27th, Northern Central, Himrods, N. Y., butting collision of freight trains, wrecking both engines and several cars. An extra fireman was killed.

xc, 27th, Pennsylvania road, Sunbury, Pa., collision of freight cars in the yard, wrecking a caboose. One employee was killed and another injured.

dn, 27th, Chesapeake & Ohio, Orange Court House, Va., a passenger train was derailed at a misplaced switch and the engine and first car were overturned; engineman and mail clerk injured.

unx, 27th, Denver & Rio Grande, Silverton, Colo., a passenger train was derailed and several cars were badly damaged. The engineman and two passengers were injured, probably fatally, and 30 other passengers suffered minor injuries.

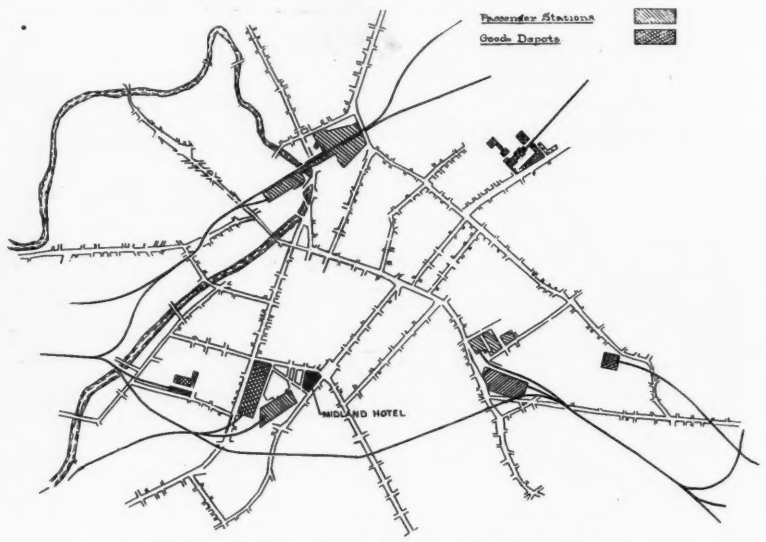
bc, 29th, 5 a.m., Norfolk & Western, Lenore, W. Va., butting collision of freight trains, wrecking both engines and 20 cars. One fireman was killed and another fireman and a brakeman were injured, probably fatally.

xc, 29th, St. Louis, Iron Mountain & Southern, Delta, Mo., a freight train collided with a freight of the St. Louis & San Francisco, at the crossing of the two roads, and one engine was wrecked. One fireman was killed and one conductor and one engineman were fatally injured.

xc, 30th, Lehigh Valley, Weatherly, Pa., three cars of coal which had escaped control ran down grade some distance and collided with a passenger train which was ascending the grade. The engineman and fireman were injured, the latter fatally.

dr, 30th, Western of Alabama, Benton, Ala., a freight train broke through a bridge, and five cars fell to the bridge below.

Midland Railway Hotel, Manchester, England.



Midland Railway Terminals at Manchester, England.

The Midland Railway Hotel at Manchester.

BY EDWARD DAVY PAIN.

The English railroads are unable to canvass by personal representation for passenger traffic, as they do for consignment of goods over their respective systems, but they use other methods for making traveling more attractive than on rival companies' lines.

The two considerations which appeal to intending travelers when a choice of routes is open to them, viz., the time taken and comfort, are carefully looked after. The Midland railway company, however. besides paying attention to these points, has endeavored to further enhance the comfort of those traveling on its roads by providing terminal hotel accommodations at the large centers. At London, Liverpool, Leeds and Bradford the company's enterprise has been most successful, and the latest addition in this direction is at Manchester, where the new hotel was opened in September last.

The design and preparation of the plans of this hotel occupied thirteen months or more, during which time Mr. William Towle, the Midland Hotel's manager, and Mr. Charles Trubshaw, the architect to the company, visited Europe and America for the adaptation of ideas for making the new structure fully modern. Manchester is served from London by five companies, the London & North Western, the Midland, the Great Northern, the Great Central, and the Great Western. It is the center of the cotton trade, and has other important industries. The number of inhabitants according to the last census was 544,000. In addition to the foregoing, the Lancashire & Yorkshire has an important station in the city.

The site of the hotel lies in the business quarter of the city, and is close to all important places of entertainment. It occupies about two acres of land, and is connected by a covered way to the station, jointly used by the Midland, the Great Northern and the Great Central.

In 1900 the work of actual construction was begun, the contract being let to Messrs. Brown & Sons, of Salford. All steel work was carried out by the Patent Shaft & Axle Company and Messrs. Dorman & Long. In March, 1902, Mr. James C. Stewart, an American, who had just completed the new Westinghouse works near Manchester, was called in to expedite matters. His active connection with the work extended over a period of twelve months.

The foundations in all cases were carried down to the solid rock; in some places they had to be at a depth of 30 ft. below street level to ensure the obtaining of a good bed, while in other places the rock had to be excavated to a depth of 20 ft. to give the necessary basement room. The average weight per superficial foot is two tons.

The backbone of the building is steel, extra thickness in

the exterior walls being used merely for architectural purposes in order to obtain the necessary shadows, so that the Renaissance style, which has been used with some freedom, may be seen to advantage. Rising from the pavement for 26 ft. the front elevations were built of red Aberdeen granite with Shap granite bands; thence to the roof the walls are of brown vitrified terra cotta blocks. The walls of the inner building rising above the glass roof of the garden are lined with white glazed tiles, so that ample light may be had in the interior of the hotel.

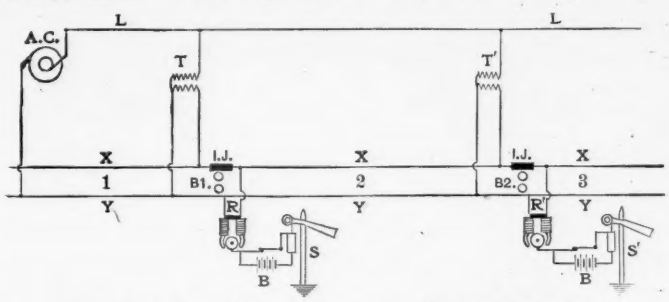
Every possible precaution has been used to prevent an outbreak of fire, all iron and steel work being covered with fireproof material, and the floors being made of concrete. Fire mains were built in throughout the building, and an alarm placed over each hydrant, communicating with the Steward's office; in addition to which there is a 6,000 gallon tank, elevated 20 ft. above the roof garden, which would give a sufficient supply until the necessary pressure was put on the water mains in the street. The decorative work in the interior of the hotel harmonizes throughout, the styles of the following periods being utilized: Louis Quatorze, Louis Quinze, Louis Seize, Adams, and Sheraton. The atmosphere of Manchester being likely to damage such work, artificial ventilation has been provided. In the concert and supper rooms the patented ventilating apparatus of the Sutcliffe Ventilating & Drying Company, of Manchester, is used, the foul air being exhausted up a special shaft. The kitchen, laundry and scullery have a special shaft of their own, as also the lavatory. Circulation of the air is ensured throughout the hotel by means of the Plenum system, the methods being of American origin. All incoming air passes through a series of filter screens of linen and coke at the rate of 80,000 cubic ft. a minute into the distributing chamber. Revolving doors are fitted at all the entrances to the building. There are four electric lifts for passengers, two for baggage, two hydraulic lifts for general purposes, and electric and hand lifts for service wherever required.

The total number of rooms is about 600; more than half of these are bedrooms. All wires are contained in a trough 12 in. wide by 3 in. deep in the floor of each passage. In each bedroom there is a telephone instrument, with which any office or house on the National Telephone Company's system can be called, special ventilation, and a synchronized clock over the door. Written messages can be sent from floor to floor through pneumatic tubes fitted by the Lampson Tube Company. Booth's Vacuum Cleaner is installed throughout the building.

There are many other minor devices to ensure the utmost comfort for the traveler. The hotel has the largest roof garden in the world, and it is 103 ft. above the level of the street. This enterprise has cost the Midland railway company the sum of over £1,000,000.

The "Young System" of Automatic Block Signals.

The Pneumatic Signal Company, of Rochester and New York City, which for several months has been developing the automatic block signal devices for electric railroads designed by Mr. S. Marsh Young, exhibited the operation of these devices to a party of railroad officers, street railroad officers and representatives of the technical press, at Float Bridge, near Rochester, last week Friday; and in connection with the exhibition gave out a partial description of the apparatus and the arrangement of circuits. The essential feature of Mr. Young's invention, that which enables him to control signals by a track circuit through rails which also are traversed by the current used for propulsion, is not described in detail, for the reason that the company's European patents have not yet been perfected. The portion of road which is equipped is on the Sodus Bay branch of the Rochester Railway Company. There are two block sections, one of them about 3,000 ft. long. The signals are semaphores, and they are worked by electric motors of the design made by the Pneumatic Signal Company, and shown in the *Railroad Gazette* of May 15 last, page 344. The power for the motor is taken from the line used to convey power to the cars, which is a direct current. The signaling current is alternating, and it makes no use of any "third rail" or trolley. The only connection from one signal to another, other than the "traffic" rails of the track, is a No. 10 copper line wire, indicated by *L* in the accompanying drawing.



Young's Automatic Block Signals for Electric Railroads.

The arrangement of circuits is shown in the diagram. The rails of the track are indicated by *X*, the "block rail," and *Y*, the "common rail." In the latter there are no insulated joints. In the block rail these joints are indicated by *I J*. The line wire, *L*, is called the A C transmission line and *A C* is the generator for this line. *T* is a transformer and *R* a track circuit relay governing the signal. At B1 and B2 there is a connection from one rail to the other, and also from rail *X* west of the joint to rail *X* east of the joint, by which rail *X* is made electrically continuous for the direct current (the power circuit), while it is broken, at the joint, so far as the signal circuit is concerned. (If the power current were alternating, a direct current would be used for signaling.) The connections or bridges, at B1, B2, while offering no resistance to the power current, prevent the passage of the alternating current and thus confine the circuit of the alternating current to the section between the two insulated joints. The two rails, serving as the return for the direct current, are of the same D C potential, but there is a difference between the two rails in A C potential. Both rails being thus available for the D C return, there is no need of an additional costly conductor.

For the signal circuit, each block section of one mile is generally supplied with 50 watts. For 30 blocks, say, 15 miles, of double track, a 2 k.w. machine is provided, and the current is carried on a No. 10 copper wire at, say, 300 volts. The transformers convert this current down at the rate of 100 to 1, and the secondaries of the transformers are connected directly to the rails, as shown. The relays R and R¹ can only be affected by alternating current of the right frequency. The contact points are closed by a partial revolution of the relay, and the direct current does not in any way affect the relay. When the block section is clear the track circuit is completed from the secondary of the transformers through one rail, through the relay and over the other rail back to the transformer. This circuit when completed holds the relay points closed, and closes the local signal circuit, which holds the signal clear. The entrance of a car into the block short-circuits the transformer, de-energizing the relay and the signal goes to stop.

The only devices in this system different from, or additional to, ordinary block signaling apparatus, are the A C generator (for a series of sections) a 50-watt transformer, the bridge (B1) at the insulated joints, and the relay, taking the place of the simple relay of other systems. This relay is the only one of these devices which has moving parts or contacts. The inventor says that no possible combination or failure of parts can produce a clear signal when a stop signal should be shown. If the insulation at the joints should fail it would result in giving a stop signal. No amount of direct current from any source can affect the operation of the signal system; neither is the signal relay affected by stray alternating currents.

Smoke Prevention.*

The constituents of all fuels may be classified as volatile matter, fixed carbon, and ash. The ash is inert as regards smoke, except that when present in large quantities, it impedes the proper handling of the fires, necessitating frequent cleaning, which is always detrimental. The fixed carbon, with which we are familiar in the form of coke, is smokeless. The remaining constituents—the volatile matter—occurs in large percentages in our western fuels, and to it the smoke is due.

When a fuel rich in volatile matter is charged into a furnace, the volatile matter is first set free as a gas, principally in the shape of hydrocarbons. Part of these are of the *olifiant* series, and are dissociated at a red heat. Part of the carbon is set free, and, if unconsumed, it passes off as smoke. It is possible to burn this free carbon, if sufficient oxygen is present, and the temperature is high. Failing in either of these conditions there will be smoke.

The free carbon in the densest smoke is very small—from one-sixth to one-half of 1 per cent. by weight. It has, however, great coloring power. You may stamp as false all claims of fuel saving due to consuming the smoke. The best furnaces, however, do make savings in fuel, not because they burn the smoke, but because improved construction and better engineering details bring about more favorable furnace conditions. The saving is often more than sufficient to pay a good interest on their cost, besides repairs and maintenance.

Broadly speaking, there are three methods of reducing smoke: First, the closing down of smoke making plants; second, the use of smokeless fuels; third, the burning of ordinary fuels smokelessly.

Heroic as it may seem, much good has been accomplished by the actual shutting down of plants. A few years ago all large cities were dotted with small factories, each with its smoke-making boiler. To-day such plants are operated by electric motors, supplied with power from central stations and provided with smoke-preventing apparatus. Many buildings get their entire service of light and power from the street mains, operating their boilers only during the cold months for heating. This practice may be expected to grow as electricity becomes cheaper, and is distributed over wider areas.

Much has been done in smokeless fuels, particularly for heating in the residence districts, and for many special operations. It is not too much to ask of the average good citizen that he will if necessary go to some expense to aid in beautifying his city. This, however, could not be expected under steam boilers, which are the largest smoke producers. It was hoped that oil from the Texas fields could be introduced at something like reasonable cost, but present rates are prohibitive. Oil has many advantages, however, which would justify a considerable increase in cost over coal. In addition to solving the smoke problem it greatly reduces the labor charge, can be handled and controlled more easily, and usually permits an increase in the working capacity of the plant. On the other hand, however, the elements of danger and of odor are ever present. As indicating in a general way what may be done under boilers with the various fuels coming to the St. Louis market I prepared a table some time ago, based on St. Louis prices ruling before the recent advances. The smokeless fuels are out of reach in cost, except possibly as the use of powdered coal may be developed.

Fuel.	Cost, dollars.	Calorific value heat units.	Efficiency, per cent.	Equivalent evaporation in lbs. of water.	Cost of evaporating 100 lbs. of water.
	Per 1,000 cu. ft.	Per 1,000 cu. ft.		Per 1,000 cu. ft.	Cents.
Fuel gas	0.10	240,000	80	198.8	50.30
	Per ton, 2,000 lbs.	Per lb.		Per lb.	
Anthracite	6.75	14,000	75	10.87	31.08
Texas oil	8.08	15,950	80	13.22	30.56
Coke	4.50	12,500	70	9.05	24.87
Pocahontas	4.75	13,300	72	9.90	24.00
Big Muddy	2.50	12,200	68	8.57	14.60
Mt. Olive, lump	1.60	11,200	65	7.53	10.62
Powdered coal	1.25	10,000	80	8.28	7.55
Common slack	0.90	10,000	60	6.20	7.25

The deliveries in this table are assumed to be on cars at consumer's switch. The oil weighs 7.43 lbs. per gallon, and at that time cost 3 cents per gallon, 2½ cents of which was freight. This price has since been raised, but even at these figures it falls far short of competing with coal, even after adding 40 to 50 cents per ton for handling the coal and ashes. The outlook for oil would be better if, instead of burning it under boilers, it be used in oil engines of the Diesel or other modern type, which consume about ¾ lb. of oil per i.h.p. hour. The ordinary Corliss engine used about 4 lbs. of Mount Olive coal per i.h.p. hour. At these figures the fuel cost would be practically the same for oil as for coal.

In the table above it is assumed that the powdered coal is made from ordinary slack, at an additional cost of 35 cents per ton for powdering. This charge will be offset by the saving in labor for coal and ash handling.

A good ordinary boiler furnace without a special device, can be so handled as to greatly reduce the smoke, providing, of course, it is not overworked. It is not necessary therefore, to buy a patent furnace. Nor will the installation of improved apparatus of itself control the smoke. A deep furnace, high bridge wall, ample grate surface and good draft are essential to a good smoke record. Such a furnace, skilfully fired, will make no serious smoke when working up to, say, two-thirds of its rated capacity. By skilful firing is meant the charging of alternate doors with small and uniform quantities of fuel, particularly if the coking system of firing is used. The firing of consecutive doors, at long intervals, with large quantities of fuel, and by the sprinkling method, is responsible for a very large proportion of our smoke. If the furnace, however, is not well designed, or is overworked, no amount of skill or care will keep the smoke within bounds. In such cases resort must be had to special apparatus.

Successful processes may be divided into five general classes:

First, Steam jets. These are the simplest devices in use, and can be put together by any engineer at small expense. Sometimes they are placed under the grates, discharging into the ash pit, but more often they are above the grate, immediately over the fire doors or in the side walls, discharging backward or across and slightly downward. The jet draws in air and discharges it at high velocity immediately above the fire, where it meets the gases being given off by the disintegrating fuel.

Devices of this character have come into extensive use. They are reasonably effective in reducing smoke, but are not usually economical in fuel. The jets are often allowed to blow continuously, but it is better to turn them on at the time of firing and then shut them off in two or three minutes, after the fresh fuel has become ignited. In some devices this is done automatically, the act of opening the fire door turning on the jet admitting steam and air, and clockwork or dash-pot mechanism gradually closing it.

Second, Coking furnaces or firebrick arches. These come next in first cost, and are capable of giving almost perfect results in smoke abatement if properly designed and intelligently operated. The fire-box is kept well away from the cooling effect of the heating surface, and can therefore be maintained at high temperature. Contracted checker work, or throat areas, insure a thorough mixture of air, which is often preheated. These are built in many forms, many of which are capable of burning inferior fuels. They are well adapted to plants where the service is reasonably uniform. The objections are that some forms require an increase of space, and the brickwork, if not properly constructed, may not be durable and repairs may be large. These objections, however, have been largely remedied in the best types. There will usually be a material saving of fuel over the common setting if properly constructed and operated.

Third, Down draft furnaces. These have proved very successful in many instances, and have come into extensive use particularly where excessive demands for overwork

*Abstract of an address by Mr. W. H. Bryan, M. E., delivered before the engineering students of Purdue University, Dec. 8, 1903.

are frequently made. In the Hawley, one of the best known forms, there are two grates, one above the other. The upper grate is a row of water tubes, single or staggered, so connected as to form a part of the circulation system of the boiler. Grates of the ordinary pattern would not withstand the high temperatures. The tubes are inclined upward to the rear to insure rapid circulation. The space above the rear drum is closed off, and the gases must make their exit downward through the bed of fuel. Considerable partly burned fuel falls to the lower grate, where its combustion is completed under very favorable conditions. The two flames unite at the rear of the grates, forming a throat through which it is almost impossible for the particles of free carbon to pass unconsumed. Somewhat greater draft is usually required for this furnace than for the common setting. Most of the air required for combustion enters through the doors above the upper grate, a small amount being admitted under the lower grate. The furnace is independent of the skill or ignorance of the fireman to a greater degree than many others. The objections are its first cost, and the fact that it is a part of the pressure system of the boiler. With bad water or careless or inefficient handling, there is great liability to tube and drum repairs. It usually effects a considerable saving in fuel.

Fourth. Automatic stokers, with which may be classed chain grates and underfeed devices. These have come into extensive use, particularly in large modern plants. While they are built in many forms, they all operate on the same principle—that of feeding the coal automatically to the grates in continuous and regular amounts. Most of them are designed for the use of the finer grades of coal, such as nut, pea or slack. In many localities there is a surplus of this fuel, and its cost is low, but the increased demand is raising the price and reducing the supply. Many recent stoker plants are provided with crushers to permit the use of the larger sizes of coal when necessary. When accompanied by coal handling and storage plants, the automtaic stoker reduces the labor required in the fireroom, and this arrangement has been adopted in many large modern plants. The ability of the stoker to maintain practically uniform steam pressure, and the fact that the air supply is nearer theoretical requirements, are features which have contributed largely to its success.

The objections to automatic stokers are: First, their great cost; second, the complication of parts and the necessity of repairs; third, the steam required to operate them. Under proper conditions there is a material saving both in fuel and labor. That the objections named are not serious is shown by the fact that their use is constantly increasing. The fuel to be burned should have expert study, however, before a device of this kind is selected, as they are not equally well adapted to all fuels. Some do not respond to fluctuating loads, and to overwork.

Fifth. Powdered fuels. These have recently attracted much attention, having for years been employed successfully in rotary cement kilns, and more recently under boilers to a limited extent. Experiments along this line have been under way for some time in European countries with considerable success. In the most satisfactory devices the coal is reduced to an almost impalpable powder, and is then forced into the furnace under pressure, exactly as would be done with oil or gas. Among the greatest advantages of this fuel is the fact that it may be made of slack or mine waste, which can be had at very low cost. While the apparatus for burning the coal is simple and inexpensive, the plant necessary for preparing the fuel is somewhat elaborate. As the fuel is explosive and liable to spontaneous combustion, it cannot be stored or handled in quantities, but should be used as fast as made. This would seem to call for a powdering plant at each point of use. There is reason for hoping, nevertheless, that good results may be looked for in this direction in the not distant future.

Double combustion furnaces and mechanical draft have also come into limited use with encouraging results, both alone and in combination with others of the above named types.

The fire-boxes of locomotives and steamboats require special treatment, but brick arches and steam and air jets have given good results. The best work is done when the two are combined. Some experiments have also been made with down-draft furnaces, with promise of success. Oil is admirably adapted for locomotives, and is already in extensive use where the cost will permit. Large grate and heating surface should be provided wherever possible.

Incidentally the smoke abatement movement has led to a clearer study of boiler conditions, with the result that the modern boiler room in arrangement, lighting, ventilation, and general efficiency, is a creditable piece of engineering. A good fireman should be encouraged. It pays to keep a good man, even at an advance in salary, for his hand is in the owner's pocket all the time.

The following are directions regarding intelligent methods of firing:

Fire frequently and in small quantities. Break up the lumps to fist size. Carry a level fire over the entire grate surface, not too thick. Avoid thin or bare spots. Keep the fires clean.

Fire one door at a time, and wait until that fire is in good shape before charging the other door. Keep the time intervals between firings as nearly uniform as possible.

Fire not over three shovels per door to begin with. If this makes no serious smoke, increase to four shovels, and then to five or six shovels until the smoke from the chimney shows that the limit has been reached.

Immediately after each firing leave the fire door slightly ajar for three or four minutes, thus admitting a little fresh air above the bed of fuel.

TECHNICAL.

Manufacturing and Business.

At Bessemer, Ala., the Central Foundry Co. will enlarge and improve its plant, increasing to 85 tons of finished product daily.

The Independent Railroad Supply Company, Chicago, has recently shipped several carloads of Wolhaupter rail joints to the Michigan Central and the Rock Island roads.

W. C. Newell and W. G. Guyton have incorporated the Southern Railroad Supply Co., at Waycross, Ga., with capital of $25,000, to do a general railroad-supply business.

The Camel Company, railroad supplies, Old Colony Building, Chicago, is sending out as a Christmas remembrance a handsome mounted reproduction, in colors, of "The Dancing Girl."

Two 24-stall roundhouses of the B. & O., one at Fairmont, W. Va., and the other at Connellsville, Pa., have been equipped with "Giant" cast-iron smoke jacks, made by Paul Dickinson, Chicago.

The Harvey Foundry & Machine Co., Chicago, Ill., has been incorporated with a capital of $25,000 to make railroad supplies, R. S. Folsom, Dwight Lawrence and J. R. Philip being the incorporators.

The Meeker Foundry Co., of Newark, has been incorporated in New Jersey with a capital of $250,000, to make iron. Incorporators: Joseph W. Plume, Frederick F. Guild and Henry A. Potter.

Eclipse Rolling Mill & Manufacturing Co., Birmingham, Ala., has been incorporated, with a capital of $50,000, to build and operate rolling mill in East Birmingham. William H. Graham is President.

The Niles Car & Mfg. Co., Niles, Ohio, at a recent meeting of its stockholders, decided to increase the capital stock from $200,000 to $300,000. The new stock has been subscribed for by the present stockholders.

The David Bell Engineering Works, Buffalo, N. Y., had a very prosperous year. Sales have exceeded those of any previous year and include 48 hammers. These hammers represent a total falling weight of 34,350 lbs.

The W. T. Manning Co. has been incorporated in Delaware, with capital of $100,000, by W. T. Manning, Stewart S. Janney, Findlay H. B. Bullock and others, to do a general contracting and construction business, with headquarters at Baltimore.

The Automatic Railway Safety Signal Company of Asbury Park has been incorporated in New Jersey, with a capital stock of $125,000, to make electric car signals. The incorporators are Geo. A. Smock, Beverly Crowell and others of Asbury Park.

The Kitson Construction Co. has been incorporated in New Jersey, with a capital of $25,000, by John C. Bogan, Philadelphia; Cuthbert H. Latta, Bethlehem, Pa., and Charles Runkle, Haddon Heights, N. J. The company is to build railroads, bridges, tunnels, etc.

The large structural iron plant of Milliken Bros., Brooklyn, N. Y., will soon be dismantled and moved to a site near Mariner's Harbor, N. Y., where the company has bought 100 acres. Work of removal will commence in about a month. The firm usually employs from 300 to 400 men.

The Webster Manufacturing Co. of Chicago, maker of elevating, conveying and power transmission machinery and gas engines, has filed articles of incorporation, capital $350,000. The officers are T. K. Webster, President; A. T. Perkins, Vice-President; John P. Lennox, Secretary, and H. G. Stephens, Treasurer.

Mr. Thomas C. Frenyear, Sales Manager of the new Canadian Westinghouse Company, died of typhoid fever at Fort William, Canada, December 10. Mr. Frenyear was born in 1865, in Vermont, and has been at various times with the Boston Electric, Thomson-Houston and Brush electric companies, and with the Cayadutta Electric Railroad. He entered the employ of the Westinghouse Company in 1895. He was a young and zealous official whose future seemed full of promise.

J. L. Mohun, Mechanical Engineer of the Western Steel Car & Foundry Company, is to be General Manager of the DeLaval Steam Turbine Company of New York and Trenton, N. J., the change taking effect January 1. Until last April Mr. Mohun was in the Motive Power Department of the Pennsylvania Railroad, where he began as special apprentice in the Altoona Shops in 1890. In 1897 he was made inspector and rose to be Assistant Engineer Motive Power of the United Railroads of New Jersey.

The cranes of the Barker Mail Crane Company, Clinton, Iowa, have been placed on the Kansas City cut-off of the Chicago, Milwaukee & St. Paul, there being a complete line of them from Ottumwa to Kansas City, over 200 miles. A mail clerk who caught the pouches at every station between the two points, reported that the release was so easy that the jar could scarcely be felt; and the ring was never pulled off of the pouch. With other forms of cranes he had often to complain of heavy jolts and injuries to pouches.

The creditors of the Southern Car & Foundry Company recently met at Chattanooga, Tenn., and the receivers reported on their transactions up to the present month. The report says: The selling value of all shipments during the receivership has been $544,163; there are unfilled orders for 500 cars, and the total value of all unfilled orders at the various plants in operation is $330,480; the value of accounts, etc., receivable is $20,620; the disbursements during the receivership, not including the court costs or attorney fees, have amounted to $135,381; the bank balance to the credit of the receivers is $432,581; there has not been much change as to the unsettled accounts that originated prior to the receivership; the liabilities so far as yet ascertained amount to $1,812,854.

Iron and Steel.

Work is being rushed at the Edgar Thomson steel works of the Carnegie Steel Co., to complete the repairs in anticipation of rush orders from the railroads expected in January.

The Republic Iron & Steel Company will resume work at its muck bar mill at Alexandria, Ind., which has been idle for a long time. The works are to be run at full capacity, giving employment to about 400 men. Coal will be used for heating in place of gas.

Representatives of about 20 steel billet manufacturing concerns met at the United States Steel Corporation recently and decided to make no further cut in price of such products. It was also decided to meet quarterly during the coming year for the purpose of exchanging views on the situation. It is stated that harmonious relations existed and that no further reductions are to be looked for.

Practically all of the properties of the Consolidated Lake Superior Company, the corporation on the Canadian and American sides at Sault Ste. Marie, were bid in at auction on Dec. 15 for $4,500,000. The purchaser was Speyer & Co., acting on behalf of the syndicate which last year advanced $5,050,000 to the company. There was no other bid. Plans are under way for a reorganization of the company.

The House of the A. S. C. E.

The American Society of Civil Engineers has issued a pamphlet for the benefit of the large number of non-resident members of the Society, giving an account of the building of the house as projected first in 1895, and opened in November, 1897, and illustrated with 15 half-tones from photographs of exterior and interior views.

Acme Gas for Railroad Shops.

The good results that have attended the use of Acme gas in industrial establishments assure that it could be profitably employed in railroad shops for many purposes. Being made from crude distillate of petroleum, it is produced cheaply, the cost being from 8 to 12 cents per 1,000 ft. Its calorific efficiency is said to be high, and it is quite similar in character to natural gas. Entire freedom from impurities is also claimed. It is made from the petroleum distillate by forcing air under pressure through a series of generations containing the liquid. The oil is stored in an underground tank and is forced into the generators by a pump which delivers the oil as fast as it is used. The air can be supplied by either a rotary positive blower or a compressor. The gas is, therefore, a combination of air and oil, the admixture being in the proper proportions to form a fixed gas. It is said to be particularly adapted to forging and welding, annealing, tempering and hardening, brazing and melting solder, replacing coke, coal and fuel oil. The character of the gas is such that special burners are not required, the gas being burned usually from an open pipe. The plants are automatic in their production of gas, making it only as fast as required and maintaining about the same relative economy for a partial supply as for full capacity. For forge work the claim is made that the output can be increased from 50 to 300 per cent. over coal or coke, resulting from the uniformity of the fire, which permits the men to give their entire attention to their work. The degree of heat is regulated by simply turning on more or less gas. There is no fire-box, and no smoke or fumes, making unnecessary hoods and uptake pipes. Other satisfactory uses of the gas are for heating core ovens and for drying moulds. Results have also been obtained which demonstrate its superiority over coke for melting brass in crucibles. Record is shown of one shop having 50 open gas forges and a number of large furnaces which showed a saving in fuel last year of $11,640 over coal. A long list of prominent users of Acme plants includes the U. S. Government for men-of-war, gun and torpedo boats and five different navy yards; also the National Cash Register Works, Dayton, Ohio, with a plant capacity of 85,000 cu. ft. per hour, Acme gas having displaced natural gas. The headquarters of the Acme Gas Company are 1,010 Monadnock Building, Chicago.

THE SCRAP HEAP.

Notes.

The Chicago & Eastern Illinois is preparing to supply its trains with emergency surgical boxes, and the employees are to be instructed in "First aid to the Injured."

A press despatch from Altoona says that the Pennsylvania Railroad is putting up telephone wires throughout its line from Pittsburg to Philadelphia. At present, we believe, the company leases long distance telephone wires from the Bell Telephone Company.

A Philadelphia paper discussing the ever open question of the rights of passengers from the west bound to New York to stop off in their city, says that in the first nine

months of this year on the Pennsylvania Railroad 30,000 passengers availed themselves of this privilege.

According to a Salamanca newspaper, the Erie Railroad has issued an order to the effect that a conductor, when giving special instructions to a flagman to hold certain trains, or when sending the flagman on any errand out of the ordinary, must give the order in writing; and also he must keep a copy himself and give one to the engineman.

The reader will recall the announcement which appeared in the *Railroad Gazette* August 28, last, that the Pennsylvania Railroad Company intended to plant a large number of young locust trees for the purpose of raising timber for sleepers. It is now announced that the 50,000 trees spoken of have been set out near Conewago, Pa.; that 150,000 more will be planted next spring, and that State Forestry Commissioner John T. Rothrick has been called in by the railroad company as an adviser in this enterprise.

According to the newspapers, Interstate Commerce Commissioner Prouty, who has been hearing a case at Hutchinson, Kan., decided the question on the spot, issuing an order to the railroad company, a proceeding which we do not remember to have heard of before. Several railroads were accused of giving a rebate to the Hutchinson Salt Company, and it appears that, in substance, this was done, though it was in the shape of a division of the through rate with a one-mile railroad owned by the salt company. The apportionment gave the short railroad, "the Hutchinson & Arkansas River," an excessive share, and, as before stated, the Commissioner decided that this discrimination against smaller shippers of salt was illegal and must be discontinued.

It appears that the blackmailers who attempted to extort large sums of money out of the Northern Pacific a month or two ago by threatening to wreck trains with dynamite, have set the fashion for train wreckers in other parts of the country. The President of the New York, New Haven & Hartford has told a reporter that that company received a demand of that kind a week or two ago. While the demand appears to have come from an insane person, it was noticed to the extent of sending extra detectives to many points along the road and keeping them on duty for a week or two. According to the *New York Sun*, the murder of a signalman in his cabin in Central Pennsylvania a month ago has been followed by seven other assaults on men in lonely signal cabins in Pennsylvania and in New Jersey. There was one attempt near Trenton, N. J.

Newspaper accounts alleging that the Toledo, St. Louis & Western has been cutting rates and dealing with ticket scalpers have culminated in a statement, said to be based on a confidential circular which has been circulated among the roads west of Chicago, saying: "One way colonist, round trip, and excursion tickets of the Clover Leaf line, issued via unauthorized routes as well as direct, have been a source of much profit to brokers. From the data at hand it would seem that the brokers have uniformly sold the tickets for passage to points short of destination, securing the portion beyond such point where the scalp is desired by attaching a rebate order, thereby defrauding the lines over which the ticket reads out of their proper share of the fare. During the period covered by this investigation, rates from and between Chicago, St. Louis and Kansas City, Omaha, Council Bluffs, Sioux City, St. Paul, and Minneapolis have been scalped at enormous profit to brokers and their accomplices. This has been done by the use of short line, homeseekers, and other excursion rates out of Toledo, which in many cases are not applicable under the published tariffs. Hundreds of these tickets during the period mentioned were sold without a single portion of such ticket reaching the terminal line collections."

Duluth Pine Lumber Product.

Reports from Duluth say that the mills in that district this year have cut 885,000,000 ft. of pine lumber. This is as great an amount as was ever cut in the district. Of the cut of this year, about 500,000,000 ft. were shipped to the East by Lake. Practically the entire cut of mills in the city of Duluth goes east by water, and with it about 100,000,000 ft. cut by interior mills.

New Holland-America Steamship.

Announcement is made that the Directors of the Holland-America Line have ordered from Harland & Wolff a 17,000 ton ship for the Rotterdam-New York service. The new boat is to be 600 ft. long, 68 ft. beam and 48 ft. deep, with a contract speed of 17 knots. The largest steamer now in the service is the "Noordam," which is approximately 3,500 gross tons smaller than the new vessel.

Wreck of "The Meteor" at Godfrey, Kansas.

The fast train of the St. Louis & San Francisco, known as "The Meteor," was wrecked at Godfrey, Kan., December 21, by running over a misplaced switch, and nine persons were killed and 20 injured. Four or five of the killed appear to have been passengers. The reports indicate that a freight train which had been ordered to remain on the main track and allow a following passenger train to enter the side track, failed to flag the passenger, and allowed it to enter the siding at full speed. The baggage car and smoking car were overturned and wrecked.

Surveys for Barge Canal.

According to press reports, surveys for the first actual work of the barge canal from Buffalo to the Hudson were begun December 14 on test sections of the work, the bids on which are expected to show whether or not the work can be done within the $101,000,000 provided for by the Canal Enlargement law. Six parties, with about 50 men in all, are working in the Fort Bull, Oneida, Savannah, Rochester, Medina and Tonawanda sections. It is proposed to pay for the preliminary surveys by a temporary loan, to be charged against the proceeds of the first bonds when sold.

Fires.

The Southern Pacific Company's passenger car shop at San Francisco was damaged by fire Dec. 3; loss about $60,000.

The Santa Fe shops at La Junta, Colo., were totally destroyed by fire Dec. 11; loss about $150,000.

The union station at Worcester, Mass., was damaged by fire Dec. 16; loss about $30,000.

The Baltimore & Ohio planing mill and paint repair shops at Lorain, Ohio, also 10 passenger cars, were destroyed by fire on the 19th inst. Loss about $125,000.

The Lewiston, Brunswick & Bath Street Ry. Co.'s car house at Lewiston, Me., was destroyed by fire Dec. 19, together with 35 cars. Loss about $50,000.

Relation of Speed to Expenses of Steamships.

The *Mechanical Engineer* (London) prints a paragraph comparing the relative coal bills and cost of engine room staff on the "Celtic" and "Oceanic" of the White Star Line. The "Celtic," designed for a working speed of 17½ knots, and intended primarily as a cargo boat, although accommodations for a large number of passengers are provided, is 700 ft. long, 75 ft. beam, and 49 ft. deep, with a gross tonnage of 20,800. The "Oceanic," built for fast, although not extremely fast, passenger service, is 704 ft. long, 68 ft. beam and 49 ft. deep, with 21 knots speed and 17,000 tons gross burthen. Thus the "Celtic" is nearly 4,000 tons larger than the "Oceanic," but only burns 240 tons of coal a day and has an engine-room staff of 96 men; whereas the "Oceanic" burns approximately 500 tons a day and has an engineroom staff of 196 men. Two men for one and two tons of coal for one are required to obtain the 3½ knots extra speed.

Telephones on the Michigan Central.

The Michigan Central is putting telephones in a number of its baggage cars, freight cabooses and wrecking cars, for use, in case of necessity, at points remote from stations, each telephone being provided with a bamboo rod for connecting to a telegraph wire on the poles adjacent to the railroad. The Michigan Central now has in use seven telephone circuits, superimposed on the telegraph lines. These circuits are: 1. Kensington, Calumet Park, Hammond, Michigan City and Michigan Yard, 44 miles. 2. Niles, Kalamazoo and Jackson, 116 miles. 3. Division Superintendent, Jackson; Master Mechanic, Jackson Junction; Trainmaster, Jackson Junction; Trainmaster, West Detroit; Superintendent of Motive Power and Equipment, West Detroit; Division Superintendent, Detroit; Detroit general offices, 76 miles. 4. Detroit Slip Dock, Windsor Slip Dock, Windsor Yard. 5. Detroit general offices, Windsor station, Windsor yard, Ridgetown; Division Superintendent, St. Thomas, 112 miles. 6. St. Thomas, Waterford, Welland, Montrose, Suspension Bridge, 116 miles. 7. Victoria Yard, Ontario and Black Rock, N. Y. The apparatus is that of the American Telephone & Telegraph Company.

The Beech Creek Coal & Coke Co.

The Pennsylvania Coal & Coke Company, which now works 30 mines in the Central Pennsylvania soft coal field, is negotiating for the purchase of the interests of the Beech Creek Coal & Coke Company, which owns 30,000 acres of coal land and works a number of mines in the territory of the Beech Creek Railroad of the New York Central. The Pennsylvania Coal & Coke Company has no connection with the Pennsylvania Railroad, and, while the present Beech Creek Coal Company is not controlled by the New York Central, the latter has a voice in the matter under consideration. It does not appear that the interests of the New York Central and its proprietary company, the Beech Creek Railroad, are in any way menaced by the contemplated change. It will be recollected that the Beech Creek extension, which has been fully described and illustrated in the *Railroad Gazette*, is one of the large pieces of construction work which the New York Central has undertaken in the last few years, and it is naturally of great importance to that company that the coal interests in the region worked, constituting the chief source of income, should be harmonious to the railroad.

Protesting Against Government Cotton Estimate.

The Journal of Commerce has made a canvass of 200 of the members of the New York Cotton Exchange having offices in New York. Only 70 of these members and firms were willing to make definite replies to the circular asking expression of opinion as to whether or not the Government estimate should be abolished on the ground that estimates have proved from 300,000 to 1,000,000 bales out of the way for the previous four years, and that it is the general opinion that a leak exists in the department by which the figures are known in advance of the proper time. Of the 70 members and firms, 46 were in favor of abolishing the government estimate against 24 in favor of retaining it. One prominent member of the Exchange is quoted to the effect that the government cannot with dignity put itself on record for a guess as to the amount of a crop before it is finished or housed. The province of the government is to give facts and only facts, and the size of the crop could not be estimated even if figures could be had from every single farmer in the United States. It is not to the interest of the farmer to give a high figure for his crop and no matter how truthful he may be he can at best only guess, before the crop is ginned.

Decision on Carloads Made Up by Two or More Shippers.

The Interstate Commerce Commission in opinions by Commissioner Prouty has decided the cases of the Buckeye Buggy Company against The Cleveland, Cincinnati, Chicago & St. Louis and others, and the C. S. Bell Co. against the Baltimore & Ohio Southwestern and the Norfolk & Western. It is held that before allowing a carload rating to a carload shipment a carrier is entitled to require that the goods shall be loaded at one time and place, that but a single bill of lading shall be issued, and that the shipment shall be from one consignor to one consignee; but when the goods are so loaded and by the terms of sale become the property of the consignee on delivery to the carrier, the carrier has no right to inquire whether consignee obtained his title from one or several owners; and if it accords the carload rate in case the consignor is the owner, failure on its part to extend the same privilege when the consignee is the owner violates sections one, two and three of the Act to Regulate Commerce. The rule covering the application of carload rates to carload lots should be so modified as to accord the same rating to consignor and consignee when the condition of ownership after the property is delivered to the carrier is the same. On the question whether a carrier may distinguish between a forwarding agent and the actual owner of the goods no opinion was expressed.

Argentina Wheat Crop and Exports.

The Statist (London) says that the crop reports from the Argentine Republic are of the most favorable character and that a record wheat yield is confidentially expected. Unfortunately, there is no really reliable return of the area sown and therefore there is no return of the exact yield per acre in previous years, but there is no doubt that there has been a decided increase in the area sown this year and returns made to the Minister of Agriculture suggest that this increase will range from 8 per cent. to 30 per cent. in the various provinces. In the last nine years the estimated yield per acre has varied from seven bushels to 14 bushels. This season the crop has suffered practically no drawbacks and it may easily be believed that the yield per acre will reach 15 bushels, which would give a total crop of 17,750,000 quarters, and leave a surplus for export of 13,000,000 quarters. This would compare with the previous six years' actual crop and export, as follows:

Argentina Wheat Crop and Exports.

	Crop, quarters.	Exports, quarters.
1903	17,750,000	13,000,000
1902	12,500,000	8,000,000
1901	7,000,000	3,000,000
1900	8,250,000	4,150,000
1899	12,750,000	9,750,000
1898	12,000,000	8,000,000
1897	6,500,000	3,000,000

Valuable Chicago Railroad Property Condemned.

In a suit brought by the Sanitary District of Chicago against the Pennsylvania Lines West of Pittsburg, seeking to have condemned a strip of land along the Chicago River between Madison and Van Buren streets forming a portion of the railroad's freight terminal property, the damages awarded to the road amount to $896,670—less than one-fifth of what was asked. The strip of land extends along the west bank of the river for 1,787 ft., and includes about 55,000 sq. ft. out of a total of 325,000 sq. ft. owned and occupied by the company. The Sanitary District wants the land in order to widen the river. Railroad officers and experts of the highest standing from different roads testified that the terminal property is worth from 13 to 16 millions and that the damage the railroad would suffer by condemnation of the strip would amount to five or six millions. Real estate experts called by the Board gave as an outside estimate for the entire Pennsylvania terminals, $475,000. The Sanitary District regards the award as a victory and the railroad has moved for a new trial, which will be argued in a few weeks.

It is said that in anticipation of an adverse decision the railroad had secured options on all the property bounded by Canal, Clinton, Madison and Van Buren streets. The report further says that the 1904 budget of the Pennsylvania for improvements sets aside a very large sum for the enlargement and improvement of the Chicago terminal facilities.

A Freight-Yard "Hotel."

At the De Witt freight yard, near Syracuse, the New York Central has established a lodging room and a restaurant, for the use of trainmen, which is called a hotel, although it is conducted on such a modest plan that it is not exactly appropriate to dignify it by that title. The two establishments are in the same building and are conducted by the same man; but the lodging rooms are of the same simple kind found at other freight terminals. The railroad company provides the building, which is a new one, with steam heat and all the usual conveniences, and it is leased to the proprietor of a Syracuse bakery, who has experience in catering. The lodging rooms are of two classes; one a large room, with plain bunks, on which trainmen can take rest without removing their clothing; and another, with more elaborate accommodations. The use of the first is free, but in the other a charge of 10 cents is made. The restaurant has been established mainly for the benefit of men whose runs

terminate at De Witt in the night. The Young Men's Christian Association is some distance from the point in the yards where the men leave their engines and cabooses, and the new building has been put up for the purpose of providing suitable accommodations just where the men want them. The intention is to furnish a regular meal only at noonday. At other times a man who wants hot food must have it cooked to order. For regular meals 25 cents is to be charged, and for this sum each customer is promised all he wants.

Railroad Extension in South Africa.

South Africa, a weekly paper devoted to the interests of that country, prints in a recent issue a summary of the extensions now in progress in railroad mileage. At the Cape there are now 634 miles of road building; in Natal, 215 miles; in Central South Africa, 647 miles; and in Rhodesia, 432 miles; making a total of 1,928. In addition to this work in progress, 465 miles of proposed lines to be built at the Cape are now awaiting official approval, 722 miles in Natal, 1,750 in Central South Africa, 820 in Rhodesia, and 1,000 miles in Bechuanaland and German and Portuguese Southwest Africa, making a total of 4,757 miles definitely projected. The following table shows the status of the Cape railroads during the last 30 years:

Cape Railroads.

Year.	Miles open.	Capital on lines open.	Net receipts per cent. on capital.
1873	63½	$4,255,640	2.62
1883	1,089	51,073,721	2.55
1893	2,253	95,243,150	4.80
1900	2,003	103,046,117	6.25
1901	2,104	107,749,164	4.41
1902	2,196	112,760,384	6.54

The Natal railroads since 1883 are also summarized, as follows:

Natal Railroads.

Year.	Miles open.	Capital on lines open.	Net receipts per cent. on capital.
1883	98½	$9,094,808	0.21
1893	399	29,512,787	2.35
1900	567	37,826,002	4.49
1901	609	41,536,176	5.76
1902	635	45,153,135	6.60

At the present time Cape Colony has the greatest mileage of railroads open, with Rhodesia second, as shown in the concluding table:

	Miles.
Cape Colony	2,396
Rhodesia	2,193
Transvaal	895
Natal	612
Orange River Colony	442

PERSONAL.

—Mr. E. H. Williams, late Assistant to the Superintendent of the Rio Grande Western, died at Hot Springs, Ark., Dec. 9, as a result of injuries received at Salina, Utah, four months ago. Mr. Williams was 38 years old and had served on the Erie, the Northern Pacific and the Oregon Short Line. On the latter road he was Chief Despatcher at Pocatello.

—Mr. Howard Elliott, whose appointment to the Presidency of the Northern Pacific was announced in the *Railroad Gazette* a few weeks since, was born in New York city in 1860, and is a descendant of John Eliot, the famous "Apostle to the Indians" of the 17th century. He was educated in Massachusetts and was graduated from Lawrence Scientific School of Harvard University, with the degree of Civil Engineer, in 1881. A year before this he had worked as rodman on the survey of a branch line of the Burlington road in Missouri. His first regular railroad service was as a clerk in the office of the Vice-President of the Burlington. After serving in the auditing department of the Burlington Lines in Missouri he was, in 1887, appointed General Freight and Passenger Agent, and in 1890 his headquarters were removed from Keokuk to St. Louis. In 1891 the Burlington placed under the control of one set of operating offices the Hannibal & St. Joseph, the St. Louis, Keokuk & Northwestern, the Kansas City, St. Joseph & Council Bluffs, and the Chicago, Burlington & Kansas City, and Mr. Elliott became General Freight Agent of the four roads. In 1896 he was made General Manager of the same roads, and in May, 1902, was elected Second Vice-President of the Chicago, Burlington & Quincy Railway Company, the company which controls the whole Burlington system.

—Mr. Lyman O. Rose, for many years Superintendent of the Delaware & Hudson Canal, died at his home in Honesdale, Pa., Dec. 14, at the age of 68.

—Mr. P. P. Wright, the well known veteran of the Lake Shore & Michigan Southern, now 79 years old, has been relieved from his most active duties and will hereafter perform only such special duties as the President or General Manager may direct. Mr. Wright has been Assistant General Manager of the Lake Shore for the past 11 years, and for many years previous was General Superintendent.

—Mr. George Francis Brownell has attained distinction in a department which rarely furnishes general officers. He has been elected First Vice-President of the Erie Railroad following the resignation of Mr. Willard, has for six years been General Solicitor of the company and remains in the legal department. Mr. Brownell is 42 years old, and his connection with the Erie began when he was a lawyer in Buffalo, a member of the firm of Moot, Sprague, Brownell & Marcy. He was born in Des Moines, Iowa, and is a graduate of the University of Michigan.

—Mr. F. Ehretsman, the new Assistant Superintendent of the Tennessee Division of the Illinois Central at Fulton, Ky., has been in railroad service since 1885, having begun on the Chicago & Grand Trunk. In 1892 he resigned from the C. & G. T. to go to the Illinois Central as an engineman. The following year he was made traveling engineer of the Chicago Division, and in November, 1901, was promoted to be Trainmaster of the Champaign District, from which position he is now promoted to the Assistant Superintendency of the Tennessee Division.

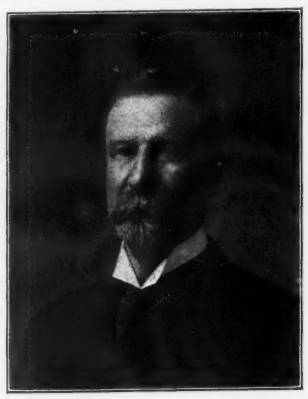
—Mr. John C. Stuart, the new General Manager of the Erie Railroad, who comes from the General Superintendency at Cleveland to New York City to succeed Mr. Willard, began his railroad career on the Central Railroad of New Jersey as a telegraph operator. From this road he went to the Chicago & North Western as Train Despatcher, where he was promoted to Trainmaster, Assistant Division Superintendent and Division Superintendent. He was later made General Superintendent of the Chicago, St. Paul, Minneapolis & Omaha, which is a part of the North Western system. Then for a time he was General Superintendent of the Baltimore & Ohio Lines west of the Ohio River, and later was General Superintendent of Transportation of the entire system. From this position he resigned to become General Superintendent of the Erie lines west of Salamanca, which place he now leaves.

—Mr. E. W. Meddaugh, for many years at the head of the legal department of the Grand Trunk, at Detroit, died at his home near that city on Sunday, December 20.

—Mr. Daniel Willard, First Vice-President of the Erie, has been chosen to succeed Mr. Howard Elliott as Second Vice-President of the Chicago, Burlington & Quincy. He has been on the Erie road for about two years. He was born in North Hartland, Vt., 42 years ago, and is a graduate of the Windsor High School. He has been in railroad service since 1879, having begun in that year in the track department of the Central Vermont. For four years, from 1879, he worked on the Passumpsic road, but resigned to go to the Lake Shore & Michigan Southern as locomotive engineer. He afterward went to the Minneapolis, St. Paul & Sault Ste. Marie in a similar capacity. Here he was promoted to be Trainmaster and then Superintendent. In 1899 he was called to the Baltimore & Ohio as Assistant General Manager, but after two years he left the B. & O. to become Assistant to the President of the Erie. After a short time in this position he was elected Third Vice-President, in charge of the operating department, and in January last was elected to be First Vice-President and General Manager.

—Mr. M. L. Byers, Assistant to the General Manager of the Baltimore & Ohio, who is promoted to the position of Assistant General Superintendent of Transportation, is 35 years old. He is a native of Pennsylvania and is a graduate of Lehigh University, class of '88. In July of that year he went to the Pennsylvania Lines West of Pittsburg as Assistant Engineer. Five years later he was made Division Engineer. For a short time he was with the American Bridge Company, but soon returned to railroad service as Engineer of Maintenance of Way of the Baltimore & Ohio. A few months later he became Assistant to the General Manager, from which position he is now promoted to be Assistant General Superintendent of Transportation.

—Mr. Theodore D. Kline, of the Central of Georgia, whose title has been changed from General Superintendent to that of General Manager, is a native of Columbia, S. C., having been born in that city 60 years ago. At the age of 15 he began work as an apprentice in the machinery department of the Charlotte & South Carolina, and after securing a thorough training he was made Master Mechanic on its successor, the Charlotte, Columbia & Augusta. For three years, from 1871, he was on the Savannah & Memphis, and for the three years following was in the transportation department of the Wilmington, Columbia & Augusta (a part of the Atlantic Coast Line). From then until his appointment in 1893 as General Superintendent of the Central, Mr. Kline served on the Richmond & Petersburg, the East Tennessee, Virginia & Georgia, the Montgomery & Eufaula, and the Mexican National and other roads.



—Mr. S. M. Manifold, who about a month ago resigned as General Superintendent of the Western Maryland, has become General Manager of the York County Traction Company, with office at York, Pa. Mr. Manifold was born in 1842 and entered railroad service in 1872 and held the positions of Superintendent and Chief Engineer of the Peach Bottom. For about seven years he was Superintendent, General Freight and Purchasing Agent of the York & Peach Bottom. In July, 1891, he was made roadmaster of the Baltimore & Lehigh. He served one year in the Transportation department of the Pennsylvania Railroad and afterward was Manager for the Receiver of the Baltimore & Lehigh. Then he became General Manager, Chief Engineer and Purchasing Agent of the York Southern and filled those positions until 1899, when he was appointed Superintendent of the Baltimore & Harrisburg Division of the Western Maryland. About a year ago he was promoted to the General Superintendency, from which position he resigned a short time ago.

ELECTIONS AND APPOINTMENTS.

Baltimore & Ohio.—T. J. Foley, hitherto Division Superintendent at Chicago, Ill., has been appointed General Superintendent of the Wheeling System, with headquarters at Wheeling, W. Va. This system consists of the Newark, Cleveland, Wheeling and Ohio River Divisions, and is newly created. J. A. Spielmann, hitherto Division Superintendent at Butler, Pa., has been appointed Superintendent of the Chicago Division, with headquarters at Chicago, succeeding Mr. Foley, and Mr. Spielmann in turn is succeeded by H. E. Hale. Mr. Hale was Division Engineer of Maintenance of Way at Philadelphia, Pa.

Canadian Pacific.—Edward A. Williams, Superintendent of Rolling Stock, at Montreal, Que., has resigned. (See Erie.)

Chesapeake & Nashville.—W. B. Meek has been appointed Acting Superintendent, with headquarters at Gallatin, Tenn., succeeding Robert Meek, deceased.

Chicago, Burlington & Quincy.—Daniel Willard, hitherto First Vice-President and General Manager of the Erie, has been appointed Second Vice-President of the C., B. & Q., with headquarters at Chicago, succeeding Howard Elliott, who resigned a few months ago to go to the Northern Pacific as President.

Chicago, Rock Island & Pacific.—On Tuesday, the 15th of this month, the lines of the C., R. I. & P. were divided for operating purposes as follows: The Central District, comprising the Chicago Terminal Division, the Illinois Division, the Iowa Division, the Nebraska Division and the Colorado Division, with H. J. Slifer, General Superintendent, Chicago, Ill., in charge. The Northern District, comprising the Cedar Rapids Division, the Dakota Division and the Des Moines Valley Division, with H. S. Carle, General Superintendent, Cedar Rapids, Iowa, in charge, and the Southwestern District, comprising the Missouri Division, the Kansas City Terminal Division, the Kansas Division, the El Paso Division and the Oklahoma Division, with J. M. Gruber, General Superintendent, Topeka, Kan., in charge.

Cincinnati, New Orleans & Texas Pacific.—On the 15th of this month the jurisdiction of W. A. Garrett, General Manager, was extended over the Traffic Departments, the General Freight Agent and General Passenger Agent reporting thereafter to the General Manager, instead of direct to the Vice-President.

Cleveland, Akron & Columbus.—R. C. Barnard, Superintendent of the Marietta Division of the Pennsylvania Company, has been appointed Superintendent of the C., A. & C., with headquarters at Akron, Ohio, succeeding H. W. Thornton. (See Pennsylvania Lines West of Pittsburg.)

Colorado & Southern.—F. T. Dolan, General Superintendent at Denver, has resigned. (See Fort Worth & Denver City.)

Erie.—At a meeting held last week, George F. Brownell, General Solicitor, was elected First Vice-President. G. A. Richardson, Assistant to the President and Secretary, becomes Second Vice-President; M. P. Blauvelt, General Auditor, becomes Comptroller; C. P. Crawford, Auditor of Coal Companies, becomes Auditor; David Bosman, Assistant Secretary, becomes Secretary, and J. E. Packer, who was in charge of the Bureau of Insurance, becomes Assistant Secretary. John C. Stuart, hitherto General Superintendent at Cleveland, has been appointed General Manager, succeeding Daniel Willard, resigned. Edward A. Williams, hitherto Superintendent of Rolling Stock of the Canadian Pacific, has been appointed Assistant General Manager. Both with headquarters at New York. Henry O. Dunkle, hitherto Superintendent at Meadville, Pa., has been appointed General Superintendent of the Ohio Division of the Erie and the Chicago & Erie Railroad, with headquarters at Cleveland, Ohio, succeeding Mr. Stuart.

See Chicago, Burlington & Quincy.

Fort Worth & Denver City.—F. T. Dolan, hitherto General Superintendent of the Colorado & Southern, has been appointed General Manager of the F. W. & D. C., with headquarters at Fort Worth, Texas, effective Jan. 1.

Illinois Central.—H. McCourt, Assistant General Superintendent, with headquarters in Chicago, has been transferred to Memphis as Assistant General Superintendent, succeeding O. M. Dunn, of New Orleans, who becomes Superintendent of the Louisiana Division, with headquarters at New Orleans. J. J. Flynn, hitherto Superintendent of the Louisiana Division, has been transferred as Superintendent of the New Orleans Division of the Yazoo & Mississippi Valley, succeeding C. N. Bell, with headquarters in Vicksburg. John Dwyer has been appointed Assistant General Freight Agent, with headquarters at Memphis, Tenn., succeeding W. L. Smith, who becomes Assistant to the Second Vice-President. J. H. Mallory becomes Commercial Agent, with headquarters at Memphis, succeeding Mr. Dwyer.

Mexican Central.—E. E. Styner, hitherto General Superintendent, has been appointed General Manager, in charge of Operating, Maintenance and Mechanical departments, to relieve H. R. Nickerson, Vice-President, to this extent, with headquarters at City of Mexico. F. B. McKercher having resigned, the office of Assistant General Manager has been abolished. Thomas Mason, hitherto Assistant General Superintendent, has been appointed Assistant to the General Manager, with headquarters at City of Mexico, and the office of Assistant General Superintendent has been abolished. D. F. Bucher, hitherto Superintendent at Monterey, Mex., has been appointed Superintendent of Transportation, with headquarters at City of Mexico.

Missouri Pacific.—J. M. Walsh has been appointed Superintendent of Terminals at St. Louis.

Pennsylvania Lines West of Pittsburg.—W. H. Scriven, Superintendent of the Cleveland & Pittsburg, has been appointed to succeed B. R. McKeen at Chicago, with the title of General Agent and Superintendent. T. B. Hamilton, now Superintendent of the Erie and Ashtabula Division, succeeds Mr. Scriven at Cleveland, Ohio. H. W. Thornton, now Superintendent of the Cleveland, Akron & Columbus Railway, succeeds Mr. Hamilton at New Castle, Pa. J. W. Coneys, now Assistant Superintendent of the Cleveland & Pittsburg Division, becomes Superintendent of the Marietta Division, with headquarters at Cambridge, Ohio, succeeding Mr. Barnard. The position formerly held by Mr. Coneys has been abolished.

Pere Marquette.—The headquarters of M. J. Carpenter, Vice-President and General Manager, have been removed from Detroit, Mich., to Chicago.

Union Pacific.—Ralph Blaisdell, heretofore Secretary, Treasurer and Auditor of the Chicago, Peoria & St. Louis of Illinois, has been appointed Assistant General Auditor of the U. P., with office at Omaha, Neb.

Wabash.—J. E. Stumpf, hitherto Trainmaster, has been appointed Superintendent of Terminals, with headquarters at St. Louis, Mo.

Yazoo & Mississippi Valley.—See Illinois Central.

LOCOMOTIVE BUILDING.

The Southern has ordered 20 locomotives from the Baldwin Works.

The Youngstown & Southern is reported to be asking bids on six locomotives.

The El Paso & Southwestern is having two locomotives built at the Baldwin Works.

The Cincinnati, New Orleans & Texas Pacific is having three locomotives built at the Baldwin Works.

The Mexican Great Eastern has not placed an order for 30 locomotives with the American Locomotive Company.

The Baldwin Works have orders for one locomotive from the following: Tacoma Eastern, Denver & Great Western and Thebaud Bros., New York.

The Chicago & Alton has ordered three simple Pacific (4-6-2) locomotives from the Baldwin Works for January delivery. These locomotives will weigh 222,000 lbs. with 145,000 lbs. on drivers; cylinders, 22 in. x 28 in.; diameter of drivers, 77 in.; straight boiler with a working steam pressure of 200 lbs.; 245 tubes 2¼ in. in diameter and 20 ft. long; fire-box, 108 in. x 66 in., and grate area, 45 sq. ft. Special equipment includes: Golmar bell ringer, Magnesia boiler lagging, Tower couplers, Monitor injectors, U. S. piston and valve rod packings, Crosby safety valves, Detroit sight-feed lubricators, Maryland sanding devices, and Ashcroft steam gages.

CAR BUILDING.

The Barre R. R. is having 50 flat cars built by the Laconia Car Company.

The Canadian Northern, it is reported, will shortly be in the market for 400 flat cars.

The Montpelier & Wells River has ordered 50 flat cars from the Laconia Car Company.

The Toledo, St. Louis & Western will shortly order six coaches, in addition to the three which it has just ordered from Barney & Smith.

The Western Maryland is in the market for 350 steel hopper cars, 300 steel gondola cars, 200 steel box cars, 50 stock cars and 50 flat cars.

The St. Louis Southwestern is having 200 cars repaired at the Madison Works of the American Car & Foundry Company. This item was incorrectly stated in our issue of Dec. 18.

The Niles Car & Mfg. Co. has completed an order for 25 electric cars for the Cleveland Electric Railway Co. These cars are to replace ones burned in a recent fire which destroyed the car barns of the electric company.

The New York Central & Hudson River has ordered 1,000 box cars of 80,000 lbs. capacity from the Western Steel Car & Foundry Co. Special equipment includes: Commonwealth bolsters, Westinghouse brakes, Ryan dust guards, McCord journal boxes and Winslow roof.

The Toledo, St. Louis & Western has ordered three first class day coaches and one buffet car from Barney & Smith. These cars will be finished in mahogany, with smoking compartments and vestibules and reclining chairs in buffet car. The day coaches will seat 85 people and the buffet car will seat 65. The cars are to be delivered in time for the World's Fair at St. Louis.

The Chicago & Alton has ordered six smoking cars from the Pullman Co. These cars will weigh 85,000 lbs. and will be 60 ft. long, 10 ft. wide and 6 ft. 10 in. high from top of sill to plate. The special equipment includes: National-Hollow brake-beams, Forsyth curtain fixtures, Pantasote curtain material, Standard Coupler Co.'s draft rigging, Safety Car Heating & Lighting Co.'s heating system, Pintsch gas, light Pullman vestibules and Boise wheels.

BRIDGE BUILDING.

ALTON, ILL.—Extensive repairs to cost about $40,000, it is reported, will be made to the Alton bridge over the Mississippi, which has recently been transferred to the railroads comprising the St. Louis Terminal R. R. Association.

ATLANTA, GA.—A $60,000 bridge for Edgewood avenue, to replace the present dilapidated wooden structure, is among the plans of the city for next year.

BINGHAMTON, N. Y.—Bids for raising the Thompson street bridge have been rejected by the Common Council and new ones are asked by the clerk of the Council Dec. 29. Work is not to commence before Feb. 1.

BROOKINGS, S. DAK.—Bids are wanted Jan. 12 by the Board of County Commissioners for furnishing the material and building all bridges needed by Brookings County during the year 1904. John Alton is County Auditor.

CENTRAL FALLS, R. I.—A bridge is to be built between this place and Pawtucket, over the Blackstone River at Cross street. It is to be a steel structure of plate girder design, 164 ft. long, and to cost $45,000. Bids have not yet been asked. Wm. F. Keene, City Engineer, will give information.

CHICAGO, ILL.—The Sanitary District has plans ready for the Dearborn street and Polk street bascule bridges, and is preparing plans for new bridges at Harrison street and Twenty-second street. Isham Randolph is Chief Engineer.

CLEVELAND, OHIO.—It is reported an agreement has been reached by the city and the Cleveland, Cincinnati, Chicago & St. Louis for the building of a bridge 58 ft. long and 36 ft. roadway with 6 ft. walks over the tracks at Denison and Ridge avenues.

An ordinance authorizing an issue of $75,000 of bonds for a new bridge at Jefferson street will soon be passed. Wm. Carter is City Engineer.

COS COB, CONN.—It is reported the New Haven Railroad is to build over Mianus River a four-track roller liftbridge of steel, to cost about $500,000.

DECATUR, ILL.—It is reported that Macon and Christian Counties have under consideration the building of a bridge over Sangamon River.

ECHO, TEXAS.—The Southern Pacific, it is reported, is preparing to build a bridge over the Sabine River at this place.

EUREKA, KAN.—Bids are wanted Jan. 7 by the County Commissioners for some stone and steel bridge work. C. D. Pritchard is County Clerk.

FREDERICTON, N. B.—The New Brunswick Government is asking separate bids for the following work: For building the boat landing bridge in Victoria County; Somerville bridge in Queens County; Calhouns bridge in Westmoreland County, and Germantown Lake bridge in Albert County.

GODERICH, ONT.—The County Council will soon ask bids for building several bridges, to be awarded at the general session.

GREENSBURG, PA.—A bill has been introduced in Congress by Representative John Dalzell, of Pittsburg, authorizing the Charleroi & Monesson Bridge Company to build a bridge over the Monongahela River from a point in Washington County to the opposite side of the river in Westmoreland County.

HARRISBURG, PA.—Bids are wanted Jan. 12 by Jas. N. Shumaker, Superintendent of Public Grounds and Buildings, for rebuilding the substructure and superstructure of the bridge over Broadhead creek at Stroudsburg, Monroe County.

The Pennsylvania will build a bridge over the tracks at Greenawalt's crossing, at a cost of about $50,000. Length, 800 ft.; width, 45 ft.

INDIANA, PA.—Viewers have recommended the building of a new bridge in Richland Township.

MARINETTE, WIS.—It is reported that J. B. Wood, of Amberg, Wis., is interested in the building of two iron bridges in the county.

MINNEAPOLIS, MINN.—The date for receiving bids for the closed bridge over the Mississippi River at 32nd avenue North has not been decided on. The bridge will be a steel truss structure of five spans, each 160 ft., with 36-ft. roadway.

MONTGOMERY, ALA.—A bill has been introduced in the Lower House of Congress to authorize the Mobile & West Alabama R. R. Co. to build a bridge over the Warrior River in Tuscaloosa County; also to authorize the building of a bridge by the same company over the Tombigbee River between Clarke and Choctaw Counties.

NEWARK, N. J.—The Delaware, Lackawanna & Western successfully moved its double deck 985-ton steel draw which is 220 ft. long, and has two tracks on the upper and one on the lower deck, a distance of 35 ft., and lowered it 11½ ft. by means of sand jacks.

NEW YORK, N. Y.—Bids are wanted Dec. 30, by Gustav Lindenthal, Commissioner of Bridges, for building four bascule bridges over Gowanus Canal at Hamilton avenue, Ninth street, Third street and at Union street, Borough of Brooklyn.

Bids are wanted Dec. 30, by the Board of Park Commissioners, for building a five-arch stone bridge in Bronx Park; also for the superstructure of a bridge over Webster avenue, and the tracks of the New York & Harlem at Mosholu parkway in the Borough of Bronx. Wm. R. Willcox is chairman.

The bids opened Dec. 21 by Bridge Commissioner Lindenthal for building the elevator towers, etc., in the Boroughs of Manhattan and Queens for the Blackwell's Island bridge were: The Snare & Triest Company, $860,900; John Pierce, $887,500; Ryan & Parker, $777,777; the R. H. Hood Company, $795,000, all of New York City, and the Williams Engineering Company, $685,000.

OLIVIA, MINN.—Bids are wanted Jan. 5, by the Board of County Commissioners, for building a steel bridge over Minnesota River near Franklin. H. J. Lee is County Auditor.

PAWTUCKET, R. I.—The Committee on Streets and Bridges is considering plans for building a bridge over the river at North Main street.

PEORIA, ILL.—The Secretary of War has notified the city that repairs must be made to the four bridges over the Illinois River. The estimated cost of repairs to two of them is $15,000.

ST. LOUIS, MO.—An ordinance, it is reported, has been approved by the Board of Public Improvements for building a bridge from McCrea to Shaw avenues over the Missouri Pacific and St. Louis & San Francisco tracks.

ST. THOMAS, ONT.—Middlesex and Elgin County Councils may jointly build a steel bridge 220 ft. long over the Thames River near the village of Dutton, at a cost of about $16,000. Address County Engineer Bell at St. Thomas, Ont.

SAN JOSE, CAL.—It is reported that bids are wanted Jan. 5 for building a concrete bridge over Calabazas Creek on Stevens Creek road. J. V. McMillan is County Surveyor.

SAVANNAH, GA.—It is reported that plans are being made by the City Engineer for the building of a viaduct at Gwinnett's street.

SUPERIOR, WIS.—The County Board may build a bridge over Nemadji River at Grand avenue to cost about $10,000.

TERRE HAUTE, IND.—The Terre Haute Electric Company is trying to obtain permission to use the Wabash River bridge. If granted, the bridge will be widened at a cost of about $44,000. D. Valentine is Chief Engineer of the company.

TORONTO, ONT.—The railway committee of the Privy Council has approved plans of the Toronto City Council for building the bridge from Front street to the Yonge street wharf, consisting of three main spans, three short spans and approaches to carry a double track for street cars, and a roadway with sidewalks over the Grand Trunk and the Canadian R. R. tracks at the foot of Yonge street.

URBANA, ILL.—Bids are wanted Dec. 29 for building a 110-ft. highway bridge. Ira O. Baker, of Champaign, Ill., can furnish particulars.

WASHINGTON, D. C.—Bids are wanted Jan. 30 by the District Commissioners for the work necessary to complete the Connecticut avenue bridge over Rock Creek.

WAUSAU, WIS.—Bids are wanted Dec. 29 for building a steel bridge over the Wisconsin River to connect the First and Seventh wards, to consist of three 80-ft. spans, with 18 ft. roadway and 6-ft. sidewalks, to rest on two stone abutments, with retaining walls and two sets of tubular piers. Chas. A. Nutter is City Engineer.

Other Structures.

ABERDEEN, S. DAK.—The Chicago, Milwaukee & St. Paul is building a new passenger station of one story 24 ft. x 182 ft., of stone and brick, and has given a contract to Nietge & Larson for the work.

BUFFALO, N. Y.—The Buffalo, Rochester & Pittsburg, it is reported, will spend $300,000 in extending its terminals at Buffalo and building new machine shops. A number of steel bridges are also to be built on the line of the road between Ashford, N. Y., and Ridgway, Pa.

CHANUTE, KAN.—The Star Drilling Machine Company of Akron, Ohio, maker of portable well drilling machinery and upright steam engines, has bought property at Chanute on which it will establish its works. The contract has been already awarded for a building 36 ft. x 72 ft., and other brick buildings will be put up shortly.

CHESTER, PA.—The Solid Steel Casting Co. will at once commence the rebuilding of a portion of its works which was recently destroyed by fire.

CINCINNATI, OHIO.—D. H. Burnham & Co., of Chicago, it is reported, are preparing sketches for a proposed new union passenger station to be built at Cincinnati by local capitalists, to be located at Third and Walnut streets.

KANSAS CITY, MO.—The Missouri Pacific, it is said, is preparing to build about ten buildings of iron and steel construction, including shops 130 ft. x 530 ft., with 24 pits for engine repairing, in which a large amount of machinery will be placed; an oil house 50 ft. x 75 ft.; storeroom and offices of two stories, 50 ft. x 150 ft.; power house, 81 ft. x 138 ft.; blacksmith shop, 100 ft. x 200 ft.; iron store house, 20 ft. x 201 ft.; planing mill, 80 ft. x 220 ft.; casting shed, 30 ft. x 200 ft.; coach shed, 100 ft. x 200 ft.; freight car repair shop, 80 ft. x 300 ft., and paint shop, 100 ft. x 200 ft., with an addition of 30 ft. x 50 ft.

PITTSBURG, PA.—It is stated that the Pittsburg & Cincinnati Packet Line, in connection with other interests, is to build a large warehouse on the south side of the Monongahela River adjoining the warehouse of the Keystone Commercial Company.

PUEBLO, COLO.—The American Automatic Switch Company is preparing plans to build a foundry 50 ft. x 100 ft., to make steel and malleable castings, and will require some iron working machinery. W. K. Smith is Secretary and General Manager.

OKLAHOMA CITY, OKLA. T.—T. J. Prosser is building a brick and stone passenger station and office building of two stories, 34 ft. 4 in. wide x 145 ft. 4 in. long, for the use of the Missouri, Kansas & Texas, to cost $15,000.

ST. JOHNS, N. B.—Bids are wanted Feb. 3, by the Imperial Dry Dock Co., for building a dry dock and other work at St. Johns, N. B. Samuel A. Corbitt is Secretary.

SACRAMENTO, CAL.—The Southern Pacific, it is reported, will build an addition to the machine shop 40 ft. high, 80 ft. wide and 515 ft. long, to be known as the erection shop addition. It is to have a steel frame and brick walls; the steel work has been ordered from the Phœnix Iron Company. An addition 63 ft. x 65 ft., of brick, is to be made to the pattern shop, and several sheds will also be built, the total cost of these improvements to be about $175,000. Plans are being prepared under the direction of John D. Isaacs, Assistant Engineer Maintenance of Way, at San Francisco.

SPOKANE, WASH.—The Motor Traction Company, it is reported, has under consideration the question of building a factory in which to make motor cars, at a cost of $100,000. A. E. Gallagher is interested in the company.

WASHINGTON, D. C.—Reports state that final awards for building the new passenger station have been announced by the Pennsylvania Company as follows: General contractors to put up the building, Thompson-Starrett Company of New York; structural steel work, American Bridge Company, and several minor contracts to New York and Chicago firms under the direction of the Washington Terminal Company, a corporation controlled jointly by the Pennsylvania and the Baltimore & Ohio.

WATER GAP, PA.—The Delaware, Lackawanna & Western has given a contract to E. S. Williams, of Scranton, Pa., for building a brick and stone passenger station of one story, 30 ft. x 228 ft., at a cost of $23,827, at this place.

WILMINGTON, DEL.—The Johnson Forge Company may soon rebuild its forge works. The new shops are to be one and two-story brick and steel structures.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ALBERNI & COWICHAN.—Application will be made at the current session of the British Columbia Legislature for an act incorporating this company. It is proposed to build a railroad from Alberni east to North Nanaimo on Vancouver Island, about 30 miles. A. C. Rhinehart, Victoria, B. C., is said to be interested.

ALTAMAHA TRANSIT.—A charter has been granted this company in Georgia to build an electric railroad from Reidsville, in Tattnall County, southwest to Port Alexander, in Appling County, 45 miles. G. T. Melton is President, and J. E. Melton, Secretary.

ARIZONA ROADS.—Press reports state that the Imperial Copper Company is preparing plans for building a 25-mile railroad from Red Rock, Ariz., to its copper mines west of Tucson. Connection will be made with the Southern Pacific at Red Rock.

BIRMINGHAM & LINEVILLE.—Work has been begun on this railroad from Lineville, Ala., west to Pyrites, in Clay County, eight miles. (Nov. 13, p. 822.)

CHOCTAW, OKLAHOMA & GULF.—It is reported that this company will extend its Searcy & Des Arc branch from Searcy to Auber, Ark., 42 miles, and also from Des Arc to Arkansas City, 108 miles. The road now runs between Searcy and Des Arc, 24½ miles.

DELAWARE, LACKAWANNA & WESTERN.—This company has begun running its trains over the new elevated line at Newark, N. J. The work on this improvement has been in progress for more than two years and the result now is the elimination of 26 grade crossings in and near Newark. A third track for suburban trains will be opened in the spring. See *Railroad Gazette* Nov. 27, p. 839.

DES MOINES, IOWA FALLS & NORTHERN.—At a recent meeting of the directors of this company a resolution was adopted authorizing four surveys for an extension of the line northeast from Iowa Falls. These surveys will be made as follows: One via Geneva and Dumont to Charles City; another via Hampton and Marble Rock to Charles City; another via Hampton to Osage, and the last via Hampton to Mason City. (Dec. 11, p. 896.)

EL PASO & SOUTHWESTERN.—The new branch from Naco to Lewis Springs, 22 miles, was opened for traffic on Dec. 15.

FRANKLIN & MEGANTIC.—It is reported that this company will extend its Kingfield and Dead River branch from Carrebasset, Me., north to Dead River, 16 miles.

GULF, COLORADO & SANTA FE (A., T. & S. F.).—It is reported that this company will build a branch line of the Cane Belt R. R., which it recently acquired, from a point near Matagorda, Texas, to the Big Hill oil fields, a distance of five miles. The Beaumont Division, extending from Summerville to Beaumont, 173 miles, is now being relaid with 60-lb. rails.

JOPLIN, NEOSHO & PIERCE COUNTY (ELECTRIC).—Articles of incorporation have been filed by this company in Missouri. It is proposed to build an electric railroad from Joplin southeast through Sarcoxie, Pierce City and Granby to Neosho, 35 miles. The incorporators are W. S. Brawner, John Kimpel and John Weathers and others of St. Louis.

LOUISIANA RAILWAY & NAVIGATION.—An officer writes that the following lines have been built in Louisiana during the past year: Baton Rouge to Irene, 12 miles; Mansura to Water Valley, 20 miles, and Colfax Junction to Winnfield, 34 miles. Work is now in progress between Irene and Angola, 37 miles. Winston, Lee & Craney, Bayou Sara, La., are the contractors. An extension from Baton Rouge to New Orleans, 78 miles, is under survey. This road was formerly the Shreveport & Red River Valley.

LOUISVILLE & NASHVILLE.—An officer writes that the principal construction work of this company during the past year has been on the Knoxville, LaFollette & Jellico, a new line from Saxton, Ky., to Knoxville, Tenn., 78.72 miles. From Saxton to LaFollette, 25.61 miles, grading has been completed and about 10 miles of track laid. Between LaFollette and Beaver Ridge, Tenn., 38.41 miles, 90 per cent. of the grading is finished, with the exception of the tunnels, of which there are four. From Beaver Ridge to Knoxville, 14.7 miles, grading is finished and track will be laid by the 31st of the month. Two branch lines are also building: The Cow Creek Branch from Dossett to Oliver Springs, Tenn., 8.9 miles, and the Clear Fork Branch, diverging from the main line a short distance south of Saxton, 6.12 miles long. Grading on the Cow Creek Branch will be completed during the present year and track laying will be finished as rapidly as possible. The grading on the Clear Fork Branch will also be completed during this calendar year. The company has built the Florala Branch from Opp, Ala., to Florala, 23.48 miles, connecting at the latter point with the Yellow River Railroad, by means of which it forms a junction with the Pensacola & Atlantic Division. There has been great activity in the Cumberland Valley district on our Cumberland Valley branch, between Middlesborough, Ky., and Norton, Va. Numerous large coal operators have opened mines and established extensive coking plants during the past year. There has also been considerable activity in the Birmingham district, where the Cain Creek Branch of the North Alabama Railroad is being built from a point seven miles north of Birmingham westward toward the Warrior River 17.58 miles. To date about 11 miles of track have been laid and 4.82 miles of side-tracks will be constructed, of which 1.9 miles have been completed. An extension of the Oneonta & Attalla Railroad from Altoona to Attalla, Ala., 15.51 miles, is being built, and grading is practically completed. Track laying, however, has not started. A tunnel on this line is delaying completion; it is expected that this tunnel will be driven about May next year. The Eastern Railway of Alabama, 19.8 miles, connecting with this company's Alabama Mineral Division at Stockdale, Ala., has also been built and leased by the L. & N. R. R. The line was opened for traffic August 24. A coal road known as the Brush Creek Road, 4.85 miles long, was built from our Kentucky Central Division at Brush Creek, Ky. This line was placed in operation July 1, 1903.

MARION & RYE VALLEY.—Press reports state that this railroad has been completed from Marion, Va., north to Sugar Grove, 40 miles. The Grayson extension is now being graded towards Fox Bottoms, Va. Connection will be made with the Norfolk & Western at Marion. J. S. Apperson, Marion, Va., is said to be interested.

MEXICAN ROADS.—Bids are being asked for building the first section of a railroad from San Juan Bautista, in the State of Tabasco, Mexico, through the towns of Nacajuca, Jalapa and Cunduacan, to a point on the Rio Seco River. Bids will be received by the Secretary of the Board of Directors at No. 21 Cinco de Mayo street, San Juan Bautista, Tabasco, Mexico. It is stated that the road will be a narrow gage railroad between 15 and 20 miles in length.

MICHIGAN CENTRAL.—Maps have been filed by this company with the State Railroad Commission showing the location of a proposed extension of its Toledo, Canada Southern & Detroit Division in Wayne County, Michigan. It will cross the Wabash and the Pere Marquette railroads.

MIDWAY & VERNON.—An act is now before the British Columbia Legislature asking for an extension of time for beginning work on this railroad. The company was granted a subsidy of $3,200 per mile at the recent session of the Dominion Parliament, with power to build a line from Midway, B. C., to Vernon, about 125 miles.

MISSOURI PACIFIC.—This company will rebuild 100 miles of track in western Kansas and eastern Colorado and will use 85-lb. rails. Between Pueblo, Colo., and the State line a large amount of ballasting will be done and a number of side tracks will also be built on the Colorado Division.

NEW BRUNSWICK COAL & R. R.—Fifteen miles of new line from Chipman, N. B., to the New Castle coal fields have been placed in operation. Grading is now in progress on two branch lines six miles long, to open up coal fields in this vicinity, and surveys are under way on an extension of 30 miles from the present terminus to Gibson. G. G. Evans, Hampton, N. B., is General Manager.

NORFOLK & WESTERN.—An officer writes that work is now in progress on the following extensions: A low-grade line from Naugatuck, W. Va., to Kenova, 59 miles; Wide Mouth branch from Cephas, W. Va., down Bluestone River, 19.7 miles; Tug Fork branch, 4.5 miles; extension from Blair, Va., to Anderson's Bottoms, 2.5 miles, and the Radford & Southern from Radford, Va., to Little River, 2.8 miles. During the year the following roads have been acquired: Iaeger & Southern from Iaeger, W. Va., to Ritter, 4.9 miles; Hillsboro R. R. from Sardinia, Ohio, to Hillsboro, 19 miles, and the Belt Line at Charleston, W. Va., one mile.

OKAW & ST. LOUIS.—This company has been incorporated to build a railroad through Collinsville, Troy, Saylor Springs and Robinson, Ill., to Terre Haute, Ind. Rights of way are now being secured and surveys are reported in progress.

ORFORD MOUNTAIN.—An officer writes that location surveys have been made for an extension from Kingsbury, Que., to Windsor Mills, 10 miles. The line will be built during 1904. H. C. Cleveland, Kingsbury, Que., is Chief Engineer.

OWNERS TERMINAL.—Articles of incorporation have been filed by this company in Illinois. It is proposed to build a railroad in Chicago from a point between Addison avenue on the north, the North branch of the Chicago River on the east, and Elliston avenue on the west. The incorporators and first board of directors are: W. W. Baird, E. H. Brush, Oliver B. Green and Geo. Goldman, all of Chicago.

PACIFIC NORTHERN & OMENICA.—Plans have been deposited with the British Columbia Government at Victoria, B. C., for a railroad from Kitamaat on the Pacific ocean north to the Skeena River. It is stated that a contract for building this line will be let as soon as the plans have been approved. B. G. Goward, Victoria, B. C., is interested.

PARKERSBURG BRIDGE & TERMINAL (WABASH).—It is stated that work will be begun in the spring on this proposed road from Johnson, W. Va., west to Little Hocking, Ohio, 11 miles. Surveys had been completed, and rights of way secured, and grading had just started when work was suspended in June. Permission was granted this company by the Secretary of War to build a bridge across the Ohio River. S. D. Brady, Parkersburg, W. Va., is Chief Engineer.

PENNSYLVANIA.—This company has appropriated the sum of $300,000 for improvements to its freight yards at East Liberty and Brushton, Pa. It is stated that work will be begun soon after January 1.

SOUTHERN PACIFIC.—With regard to work now in progress on the lines of this company in California an officer writes that the Montalvo branch from Simi tunnel, Chatsworth Park, is nearly finished. It will be 4.8 miles long. A branch extending this line from Chatsworth Park to Burbank, 16.9 miles long, has been completed but is not yet in operation. Erickson & Peterson, Chatsworth Park, Cal., were the contractors. The Imperial & Gulf, now operated from Old Beach to Imperial, 28.6 miles long, will be extended at once to Calexico, on the International boundary line between the United States and Mexico. A portion of the original line between Strauss and the Rio Grande, in New Mexico, has been abandoned and a new location is being surveyed. (Dec. 18, p. 912.)

STOCKTON & SOUTHEASTERN.—Contracts for grading this line from Eldorado Springs, Mo., southeast to Stockton, 20 miles, will be let about Feb. 1. Surveys have been made and rights of way secured between these two points. The railroad will eventually be extended to Springfield, Mo. Connection will be made with the Missouri, Kansas & Texas at Eldorado Springs. W. H. Wood, Kansas City, is Chief Engineer. (Nov. 13, p. 822.)

TOPEKA, FRANKFORT & NORTHWESTERN (MISSOURI PACIFIC).—A charter has been granted this company in Kansas to build a railroad from Topeka northwest to Waterville, 70 miles, through the Counties of Shawnee, Pottawatomie and Marshall. The company is said to be a Missouri Pacific project. Among the directors are B. P. Waggener, Atchison, Kan.; T. J. Anderson and J. A. Troutman, Shawnee; W. J. Gregg, Marshall, and J. C. Morrow, Washington. The headquarters of the company will be at Topeka, Kan.

WEST VIRGINIA ROADS.—Press reports state that the Coal River & Western R. R. has completed 13 miles of its line from St. Albans, W. Va., to the forks of the Coal River. C. K. McDermott, St. Albans, is General Superintendent.

WHEELING & LAKE ERIE.—It is stated that this company will build between 30 and 40 passing tracks on its Toledo Division, and a number of sidings at Norwalk Junction, Ohio. This is in preparation for the large increase in freight traffic which will result from the completion of its Pittsburg extension in the spring of 1904.

ZANESVILLE, MARIETTA & PARKERSBURG.—An officer writes that surveys have been completed from Little Hocking, Ohio, to Zanesville, 62 miles. Grading, which is in progress between Sharpsburg and Zanesville, 42 miles, has been finished for a distance of 10 miles. S. D. Brady, Parkersburg, W. Va., is Chief Engineer.

GENERAL RAILROAD NEWS.

ATCHISON, TOPEKA & SANTA FE.—This company has sold to J. P. Morgan & Co. $10,000,000 of its general mortgage 4 per cent. bonds to provide for the purchase of cars and engines and for building various extensions. According to the annual report of the company for the year ending June 30, there remain unissued general mortgage bonds amounting to $15,000,000, of which more than $10,000,000 are now available under the terms of the mortgage, which provides that $3,000,000 may be issued yearly for improvements. The following statement was recently made by an official of the company: The company has no floating debt and never had any, it being the policy of the management to provide in advance for contemplated capital expenditures. The additional equipment is needed to meet the requirements of the company's traffic, as the company for some time past has been unable to properly handle the business offered. It is reported that J. P. Morgan & Company have re-sold the greater part of these bonds to various insurance companies and to foreign investors.

CHICAGO, ROCK ISLAND & PACIFIC.—See Pine Bluff & Western below.

FOREST CITY & GETTYSBURG.—The foreclosure sale of this road has been ordered to take place at Gettysburg, S. Dak., on Jan. 2. The road is to be sold because of an action brought against it by the New York Security & Trust Company. The line extends from Forest City to Gettysburg, 22 miles.

IOWA CENTRAL.—The report of this company for the fiscal year ending June 30, shows gross earnings of $2,405,545 as against $2,543,349 in 1902. Operating expenses were $1,966,999, and there is an increase in net earnings of $1,004. Although gross earnings decreased, the report shows that a like decrease in operating expenses is not caused by sacrificing necessary maintenance improvements. There is only a slight difference in maintenance charges in the reports for 1902 and 1903.

MISSOURI, KANSAS & TEXAS.—Articles of consolidation have been filed by the Missouri, Kansas & Oklahoma and the Texas & Oklahoma railroads. The consolidated company will be known as the Missouri, Kansas & Texas.

PINE BLUFF & WESTERN.—This road, which runs from Pine Bluff, Ark., to Benton, 45 miles, has been sold to the Chicago, Rock Island & Pacific.

ST. CLAIR, MADISON & ST. LOUIS BELT.—See Terminal R. R. Association of St. Louis below.

TERMINAL R. R. ASSOCIATION OF ST. LOUIS.—The Alton bridge (St. Clair, Madison & St. Louis Belt R. R.) has been purchased by 10 of the 14 lines which compose the Terminal Association. The four dissenting lines which are not included in the agreement are the Southern, the Chicago, Burlington & Quincy, the Illinois Central, and the Chicago & Alton. It is said that $40,000 will be necessary to put the property in good condition. The price paid by the new owners is said to have been $1,000,000. The Alton bridge bears a bonded indebtedness of $800,000 at 4 per cent.

WASHINGTON COUNTY.—This road, which runs from Washington Junction, Me., to Eastport, 102 miles, was sold at auction on Dec. 17. The road was purchased by F. W. Whitridge, of New York, President of the company, who will form a new corporation under the same name.

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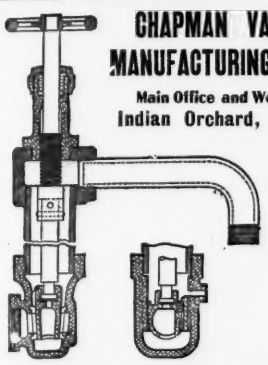

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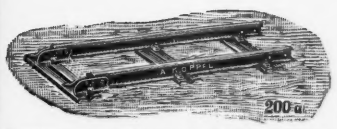

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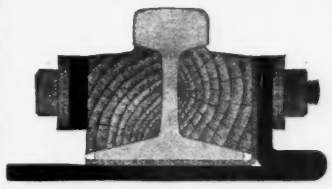

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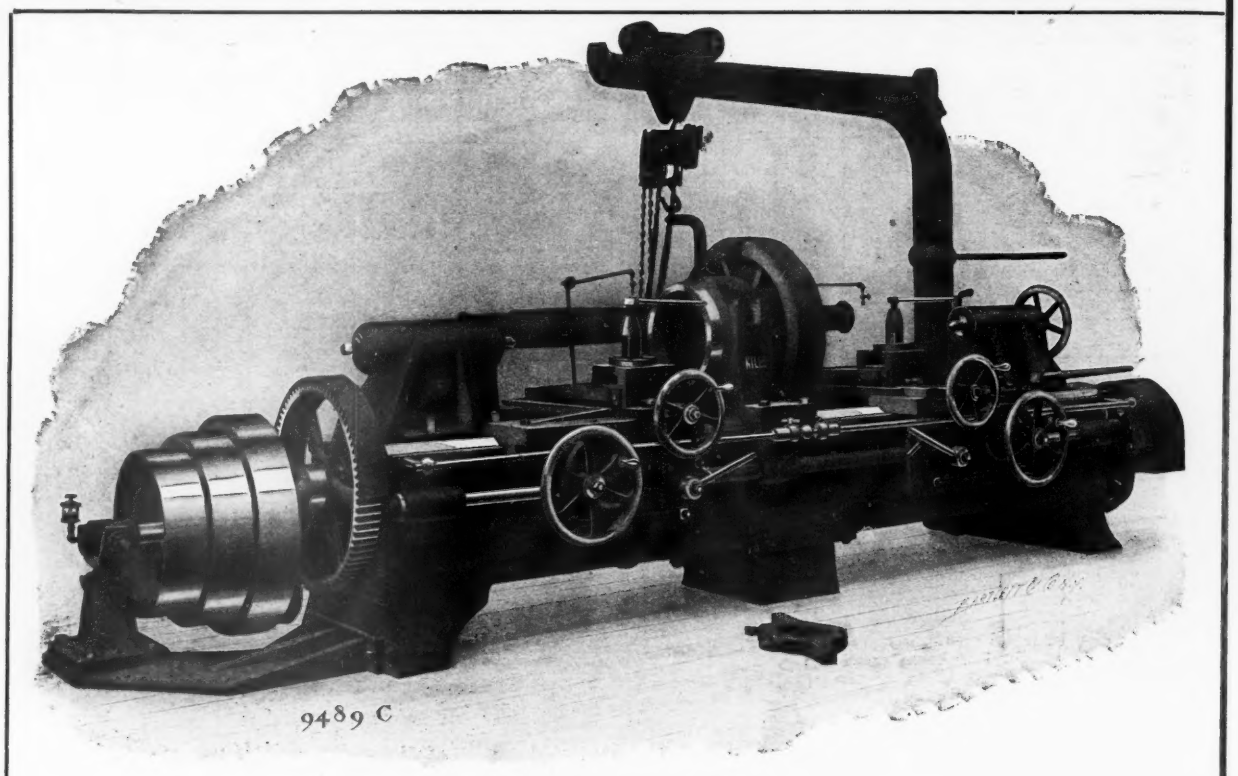

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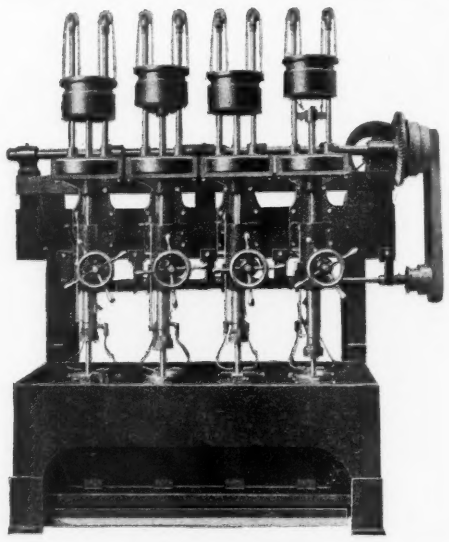

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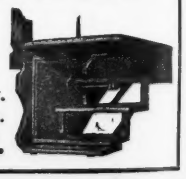

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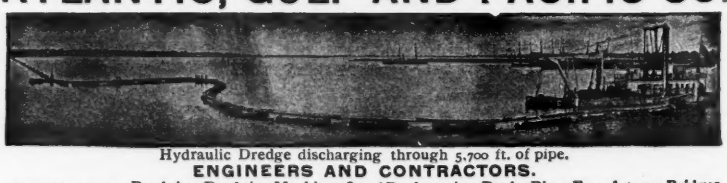

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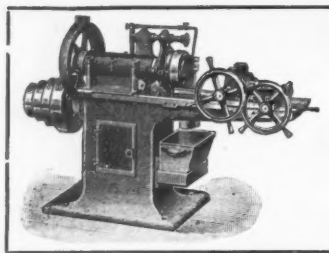

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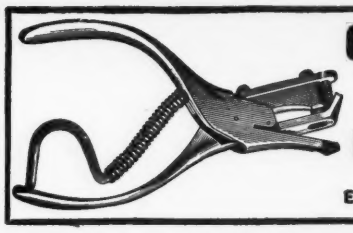

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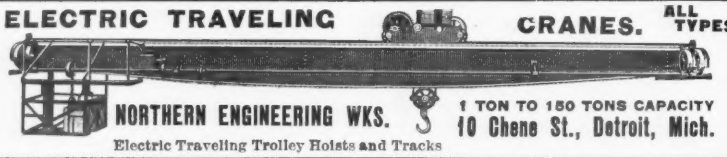

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83 Fulton Street NEW YORK

THE "AXLE LIGHT" SYSTEM OF ELECTRIC LIGHTS AND FANS
FOR ALL KINDS OF PASSENGER CARS
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RAILROAD GAZETTE DIRECTORY CLASSIFIED ADVERTISEMENTS.

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Pogson, Peloubet & Co., New York, Chicago, St. Louis, Butte.

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Corrington Air Brake Co., Matteawan, N. Y.
Westinghouse Air Brake Co., Pittsburgh, Pa.

AIR BRAKE FITTINGS
Corrington Air Brake Co., Matteawan, N. Y.
Crane Co., Chicago, Ill.
Westinghouse Air Brake Co., Pittsburgh, Pa.

AIR BRAKE HOSE
(See Hose, Air, Steam, etc.)

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Chicago Pneumatic Tool Co., Chicago, Ill.
Fairbanks, Morse & Co., Chicago, Ill.
Ingersoll-Sergeant Drill Co., New York, N. Y.
Manning, Maxwell & Moore, New York, N. Y.
McKiernan Drill Co., New York, N. Y.
Rand Drill Co., New York, N. Y.
Standard Traction Brake Co., New York.
Howard W. White & Co., Chicago, Ill.
Willis Shaw, Chicago, Ill.

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AIR HOSE COUPLERS
Chicago Car Heating Co., Chicago, Ill.
Consolidated Car Heating Co., Albany, N. Y.
Safety Car Heating & Light. Co., New York.

AIR LIFT PUMP
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Stanley Electric Mfg. Co., Pittsfield, Mass.
Westinghouse Electric & Mfg. Co., Pittsburgh.

ANGLE BARS
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Pennsylvania Steel Co., Steelton, Pa.
Howard W. White & Co. Chicago, Ill.

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Franklin Mfg. Co., Franklin, Pa.
H. W. Johns-Melville Co., New York, N. Y.

AUDITORS
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Motley, Green & Co., New York, N. Y.
Otis Steel Co., Cleveland, O.

BABBITT METAL (See Journal Bearings.)

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M. C. Hammett, Troy, N. Y.

BALL BEARINGS
Baltimore Ry. Specialty Co., Baltimore. Md.

BALLAST CARS
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The Goodwin Car Co., New York, N. Y.
Pressed Steel Car Co., Pittsburgh, Pa.
Standard Steel Car Co., Pittsburgh, Pa.

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A. Leschen & Sons Rope Co., St. Louis, Mo.
Lidgerwood Mfg. Co., New York, N. Y.
Marion Steam Shovel Co., Marion, O.

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Prince & Whitely, New York, N. Y.

BAND SAWS
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S. A. Woods Machine Co., So. Boston, Mass.

BARRELS (WELDED STEEL)
Welded Steel Barrel Corp., Detroit, Mich.

BATTERIES, ELECTRIC
Edison Mfg. Co., New York, N. Y.
Gordon Battery Co., New York.

BEARING METAL (See Journal Bearings.)

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M. C. Hammett, Troy, N. Y.
Manning, Maxwell & Moore, New York, N. Y.
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Western Ry. Equipment Co., St. Louis, Mo.

BLOCK SIGNALS (See Signals.)

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A. Leschen & Sons Rope Co., St. Louis, Mo.
Motley, Green & Co., New York, N. Y.

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Buffalo Forge Co., Buffalo, N. Y.
B. F. Sturtevant Co., Boston, Mass.

BOILER & PIPE COVERINGS

BOILER PLATES (See Plates, Boiler.)

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Falls Hollow Staybolt Co., Cuyahoga Falls, O.

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Shelby Steel Tube Co., Pittsburgh, Pa.
Standard Seamless Tube Co., Pittsburgh, Pa.
Howard W. White & Co., Chicago, Ill.
Worth Bros. & Co., Coatesville, Pa.

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Fairbanks, Morse & Co., Chicago, Ill.
Henschel & Sohn, Cassel, Germany.
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Locomotive & Machine Co., of Montreal.
Lidgerwood Mfg. Co., New York, N. Y.
Rand Drill Co., New York, N. Y.
Howard W. White & Co., Chicago, Ill.
Willis Shaw, Chicago, Ill.

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Simplex Ry. Appliance Co., Hammond, Ind.
Standard Steel Car Co., Pittsburgh, Pa.

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Acme Machinery Co., Cleveland, O.
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Niles Tool Works Co., New York, N. Y.
Pratt & Whitney Co., Hartford, Conn.

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Niles Tool Works Co., New York, N. Y.
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The Railroad Gazette, New York, N. Y.

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Pawling & Harnischfeger, Milwaukee, Wis.

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J. G. Brill Co., Philadelphia, Pa.
Chester Steel Castings Co., Philadelphia, Pa.
Commonwealth Ry. Supply Co., Chicago, Ill.
Mechanical Mfg. Co., Chicago, Ill.

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Consolidated Ry. Elec. Ltg. & Equip. Co., N.Y.

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Aurora Metal Co., Aurora, Ill.
Damascus Bronze Co., Pittsburgh, Pa.
Magnus Metal Co., Buffalo, N. Y.
More-Jones Brass & Metal Co., St. Louis, Mo.
Paul S. Reeves & Sons, Philadelphia, Pa.

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Baltimore Bridge Co., Baltimore, Md.
Broderick & Bascom Rope Co., St. Louis, Mo.
Garry Iron and Steel Co., Cleveland, O.
H. W. Johns-Manville Co., New York, N. Y.
The King Bridge Co., Cleveland, O.
A. Leschen & Sons Rope Co., St. Louis, Mo.
Locomotive & Machine Co., of Montreal.
Louisville Bridge & Iron Co., Louisville, Ky.
McClintic-Marshall Construction Co., Pittsburgh, Pa.
The Males Co., Cincinnati, O.
Missouri Val. B. & I. Wks., Leavenworth, Kan.
Osborn Engineering Co., Cleveland, O.
John F. O'Rourke, New York, N. Y.
Passaic Steel Co., Paterson, N. J.
Pennsylvania Steel Co., Steelton, Pa.
Phoenix Bridge Co., Philadelphia, Pa.
Snare & Triest, New York, N. Y.
Scherzer Rolling Lift Bridge Co., Chicago, Ill.
C. L. Strobel, Chicago, Ill.

BRIDGE PAINT (See Metallic Paint.)

BRIDGE TIMBER (See Timber.)

BUFFERS (See Car Couplers.)

BULLDOZERS
Ajax Mfg. Co., Cleveland, O.
Howard W. White & Co., Chicago, Ill.

BUMPING POSTS
McCord & Co., Chicago, Ill.
Mechanical Mfg. Co., Chicago, Ill.

CABLES
Broderick & Bascom Rope Co., St. Louis, Mo.
A. Leschen & Sons Rope Co., St. Louis, Mo.

CABLE GREASE
A. C. Stalknecht, Saginaw, Mich.
U. S. A. Cable Grease Co., Saginaw, Mich.

CABLEWAYS
Broderick & Bascom Rope Co., St. Louis, Mo.
S. Flory Mfg. Co., Bangor, Pa.
Lambert Hoisting Engine Co., Newark, N. J.
A. Leschen & Sons Rope Co., St. Louis, Mo.
Lidgerwood Mfg. Co., New York, N. Y.
Willis Shaw, Chicago, Ill.

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Handy Car Equipment Co., Chicago, Ill.
F. M. Hicks, Chicago, Ill.
Jewett Car Co., Newark, O.
Arthur Koppel, New York, N. Y.
Lima Locomotive & Mach. Co., Lima, O.
The Males Co., Cincinnati, O.
Middletown Car Works, Middletown, Pa.
Motley, Green & Co., New York, N. Y.
Mt. Vernon Car Mfg. Co., Mt. Vernon, Ill.
Pressed Steel Car Co., Pittsburgh, Pa.
Russell Car & Snow-Plow Co., Ridgway, Pa.
Standard Steel Car Co., Pittsburgh, Pa.
Western Steel Car & Fdy. Co., Chicago, Ill.
Willis Shaw, Chicago, Ill.

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Apex Equipment Co., New York.
Catawissa Car & Fdy. Co., Catawissa, Pa.
Goodwin Car Co., New York, N. Y.
C. W. Hunt Co., New York, N. Y.
Ingoldsby Automatic Car Co., St. Louis, Mo.
Arthur Koppel, New York, N. Y.
Lima Locomotive & Machine Co., Lima, O.
Pressed Steel Car Co., Pittsburgh, Pa.
Russell Car & Snow-Plow Co., Ridgway, Pa.
Standard Steel Car Co., Pittsburgh, Pa.
Willis Shaw, Chicago, Ill.

CAR SEATS
American Car Seat Co., Brooklyn, N. Y.
Heywood Bros. & Wakefield Co., Wakefield.
Holland Co., Chicago, Ill.
Richards Chair Panel Co., Chicago, Ill.

CARSTEP-FOLDING
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CARS, TIP
Hunt Co., C. W., New York, N. Y.
Arthur Koppel, New York, N. Y.

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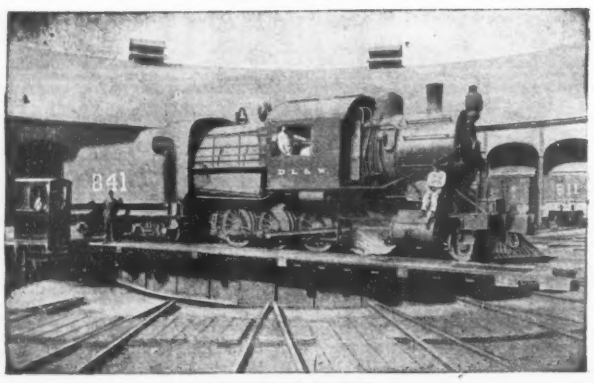
ELECTRIC MOTORS



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BULLARD CAN HELP YOU.

Why pay a helper to hold pieces o' this description up to the face-plate of a lathe while the operator wastes time trying to secure and counter-balance same, when it could be set on the table of a Bullard Boring and Turning Mill and, with our Combination Chuck, adjusted in a fraction of the time without the assistance of a helper? After Combination Chuck has been set for the first piece, duplicates can be held without any adjustment. You cannot appreciate the saving in time, temper and money effected by a Bullard Mill until you have used one. They are a great improvement on a lathe for this class of work. While there is a large saving on even one piece, the saving increases where a number are to be done.

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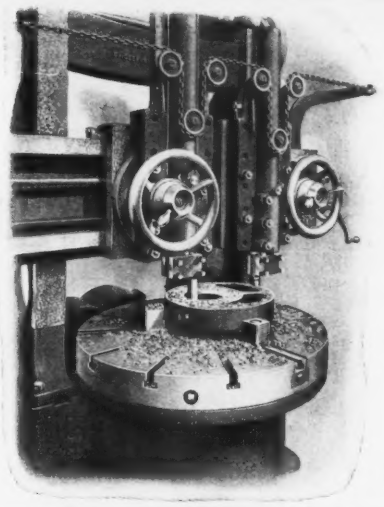

RAILROAD GAZETTE DIRECTORY CLASSIFIED ADVERTISEMENTS.

Link-Belt Engineering Co., Nicetown, Pa.
Russell Car & Snow-Plow Co., Ridgway, Pa.

CAR COUPLERS
Buckeye Mall. Iron & Coup. Co., Columbus, O.
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Nat'l Malleable Castings Co., Cleveland, O.
Pennsylvania Malleable Co., Pittsburgh, Pa.
Western Ry. Equipment Co., St. Louis, Mo.

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Troy Malleable Iron Co., Troy, N. Y.

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McGuire Mfg. Co., Chicago, Ill.
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Estate William C. Baker, New York, N. Y.
Safety Car Heating & Light Co., New York.

CAR HEATING HOSE (See Hose.)

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Consolidated Car Heating Co., Albany, N. Y.
Consolidated Ry. Elec. Light & Equip. Co., N.Y.
H. W. Johns-Manville Co., New York, N. Y.
Safety Car Heating & Light Co., New York.

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Consolidated Ry. Elec. Light & Equip. Co., N.Y.
Safety Car Heating & Light Co., New York.

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Handy Car Equipment Co., Chicago, Ill.
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H. W. John-Manville Co., New York, N. Y.
Standard Ry. Equip. Co., St. Louis Mo.
Standard Paint Co., New York, N. Y.

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CAR SPRINGS (See Springs.)

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Griffin Wheel Co., Chicago, Ill.
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Lima Locomotive & Mach. Co., Lima, O.
Lobdell Car Wheel Co., Wilmington, Del.
Mt. Vernon Car Mfg. Co., Mt. Vernon, Ill.
Standard Steel Works, Philadelphia, Pa.

CASTINGS (See Forgings and Castings.)

CATTLE GUARDS
American Bridge Co., New York, N. Y.
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R. R. Supply Co., Chicago, Ill.

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H. W. Johns-Manville Co., New York, N. Y.
Robins Conveying Belt Co., New York, N. Y.

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Westinghouse, Church, Kerr & Co., New York.

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Pittsburgh Testing Laboratory, Pittsburgh.

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Hunt Co., C. W., New York, N. Y.
Kaltenbach & Griess, Cleveland, O.
The King Bridge Co., Cleveland, O.
Lambert Hoisting Engine Co., Newark, N. J.
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Lidgerwood Mfg. Co., New York, N. Y.
Link-Belt Engineering Co., Philadelphia, Pa.
Link-Belt Machinery Co., Chicago, Ill.
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J. S. Mundy, Newark, N. J.
Robins Conveying Belt Co., New York, N. Y.
Willis Shaw, Chicago, Ill.

CONCRETE BUCKETS
Cyclopean Iron Works, Jersey City, N. J.

CONCRETE MIXERS
Contractors Supply & Equipment Co., Chicago.
Kaltenbach & Griess, Cleveland, O.

CONDUITS
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Wyckoff Pipe & Creo. Co., Stamford, Conn.

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E. Bevert, Chicago, Ill.
Blood & Hale, Boston, Mass.
V. C. Bogue, 66 Broadway, N. Y.
Concrete-Steel Engineering Co., New York.
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Haupt & Franklin, Philadelphia, Pa.
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Kaltenbach & Griess, Cleveland, O.
Albert Lucius, New York, N. Y.
Osborn Engineering Co., Cleveland, O.
O'Rourke Engineering Const. Co., New York.
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Wm. R. Webster, Philadelphia, Pa.
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Bucyrus Co., Milwaukee, Wis.
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The S. Flory Mfg. Co., Bangor, Pa.
Garry Iron & Steel Co., Cleveland, O.
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Ingersoll-Sergeant Drill Co., New York, N. Y.
Arthur Koppel, New York, N. Y.
A. Leschen & Sons Rope Co., St. Louis, Mo.
Lidgerwood Mfg. Co., New York, N. Y.
Marion Steam Shovel Co., Marion, O.
Motley, Green & Co., New York, N. Y.
J. S. Mundy, Newark, N. J.
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Rand Drill Co., New York, N. Y.
Vulcan Iron Works Co., Toledo, O.
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CONVEYORS (See Hoisting and Conveying Machinery.)

COPPER AND NICKEL ORES
Orford Copper Co., New York, N. Y.

CORDAGE
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A. Leschen & Sons Rope Co., St. Louis, Mo.

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Pennsylvania Cor. School, Pittsburgh, Pa.

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St. Louis Expanded Fireproofing Co., St. Louis.

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Franklin Mfg. Co., Franklin, Pa.
H. W. Johns-Manville Co., New York, N. Y.

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Bucyrus Co., So. Milwaukee, Wis.
Brown & Zortman Mach. Co., Pittsburgh, Pa.
Case Mfg. Co., Columbus, O.
Chicago Pneumatic Tool Co., Chicago, Ill.
Garry Iron & Steel Co., Cleveland, O.
Henschel & Sohn, Cassel, Germany.
Industrial Works, Bay City, Mich.
Kaltenbach & Griess, Cleveland, O.
The King Bridge Co., Cleveland, O.
Manning, Maxwell & Moore, New York, N. Y.
Niles-Bement-Pond Co., New York.
North'n Engineering Wks., Detroit, Mich.
Pawling & Harnischfeger, Milwaukee, Wis.
Wm. Sellers & Co., Philadelphia, Pa.
Howard W. White & Co., Chicago, Ill.
R. D. Woods & Co., Philadelphia, Pa.

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Northern Engineering Wks., Detroit, Mich.
S. Obermayer Co., Cincinnati, O.
Howard W. White & Co., Chicago, Ill.

CRANK PINS
B. M. Jones & Co., Boston, Mass.
Krupp (Prosser & Son), New York, N. Y.
Motley, Green & Co., New York, N. Y.

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Southern Creosoting Co., Slidell, La.
West Pascagoula Creo. Works, West Pascagoula, Miss.
Wyckoff Pipe & Creo. Co., Stamford, Conn.

CROSSING GATES
Buda Fdy. & Mfg. Co., Harvey, Ill.
Pneumatic Gate Co., Chicago Ill.
Pneumatic Signal Co., New York.

CROSSING SIGNALS (See Signals.)

CURTAIN MAKERS
Curtain Supply Co., Chicago, Ill.
Federal Mfg. Co., Cleveland, O.

CUPOLAS
Northern Engineering Wks., Detroit, Mich.
S. Obermayer Co., Cincinnati, O.

CURTAIN FIXTURE MAKERS
Curtain Supply Co., Chicago, Ill.
Federal Mfg. Co., Cleveland, O.

CURTAIN FIXTURES
Curtain Supply Co., Chicago, Ill.
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Broderick & Bascom Rope Co., St. Louis, Mo.
Lambert Hoisting Engine Co., Newark, N. J.
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DESKS
A. H. Andrews Co., Chicago, Ill.

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DITCHING MACHINERY (See Contractors' Machinery.)

DOORS, STEEL ROLLING
Kinnear Mfg. Co., Columbus, O.
Jas. G. Wilson Mfg. Co., New York, N. Y.

DOOR STOPS AND HOLDERS
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Yale & Towne Mfg. Co., New York, N. Y.

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Nat'l Car Coupler Co.'s Works, Converse, Ind.
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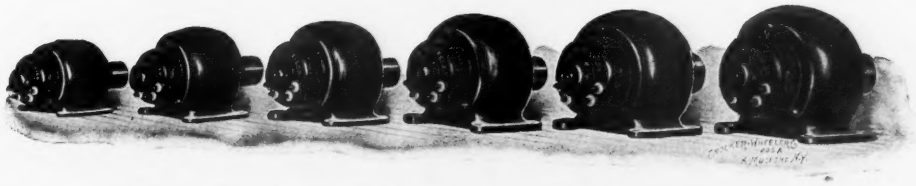

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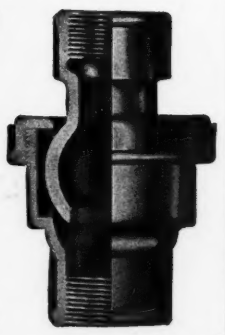

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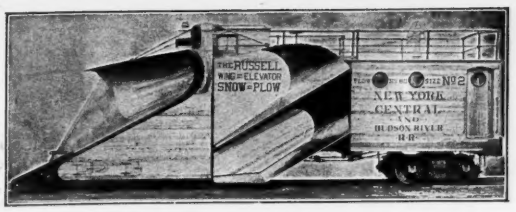

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The Niles Tool Works Co., Hamilton, O.
Pratt & Whitney Co., Hartford, Conn.
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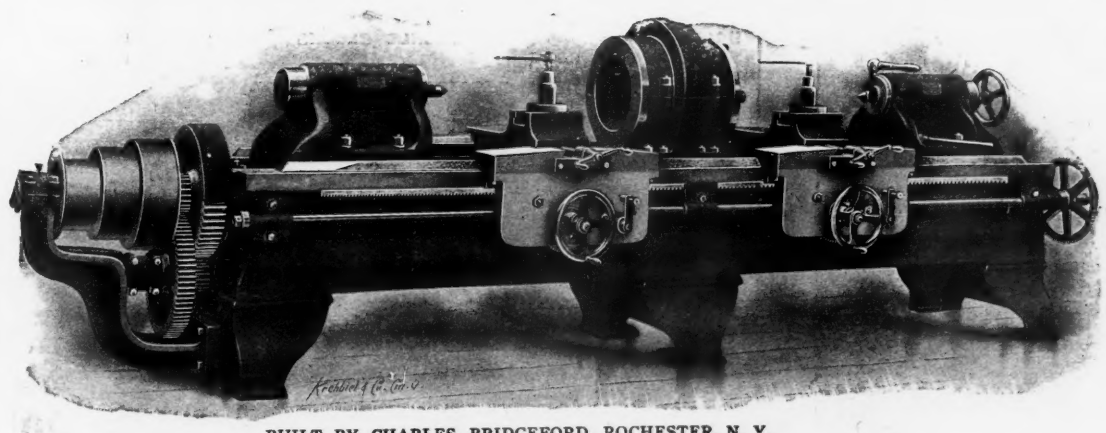

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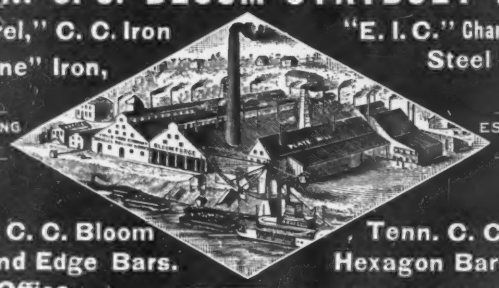

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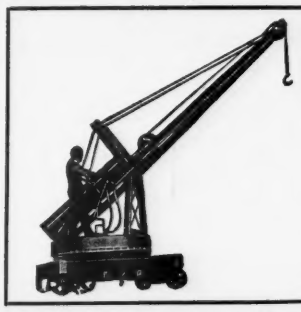

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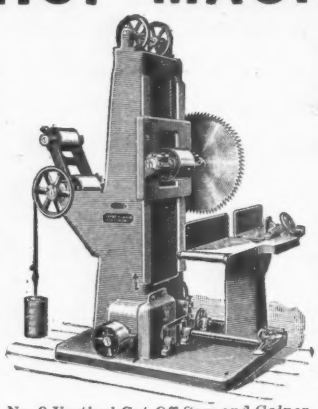

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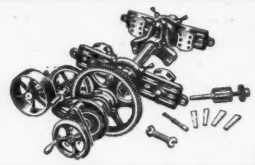

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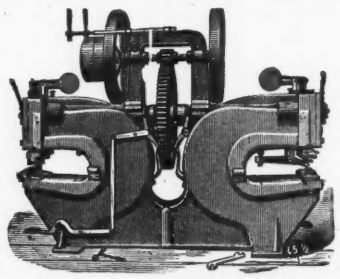

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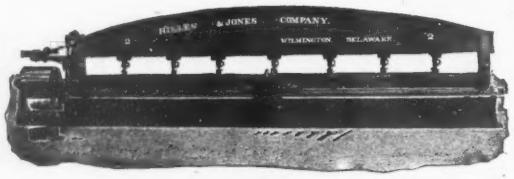

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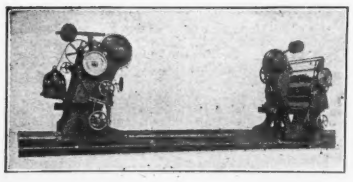

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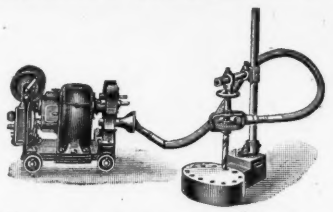

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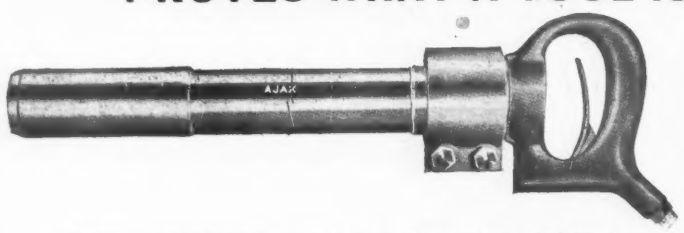

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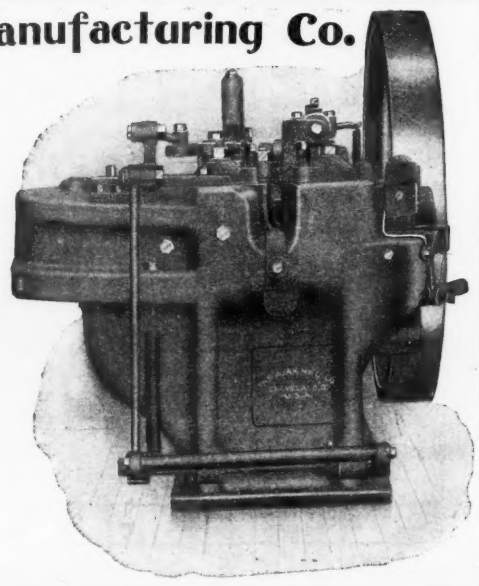

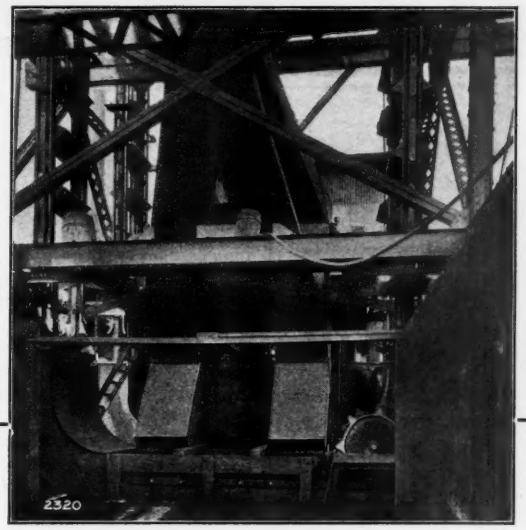

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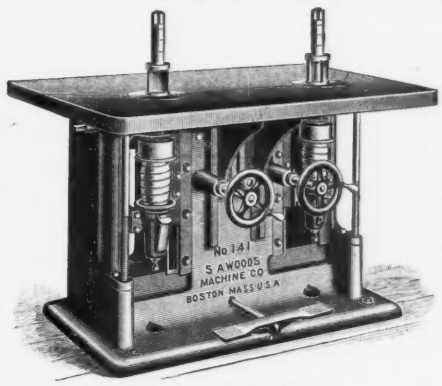

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WITH TWO SPINDLES

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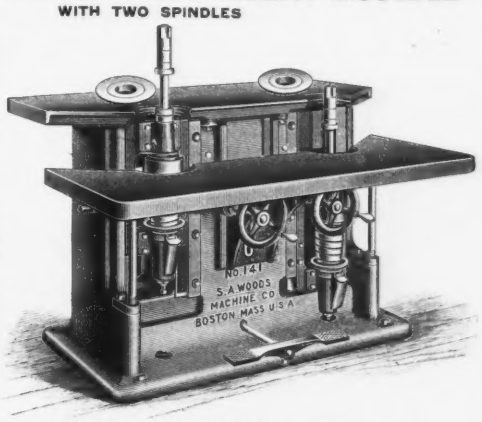
FRONT SECTION DROPS 7½"



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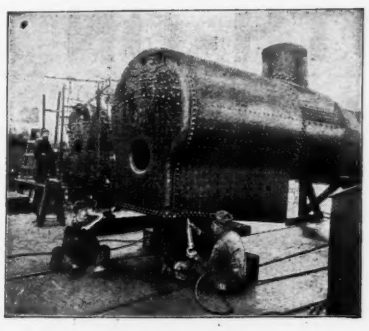

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MAN is a tool-using animal. Feeblest of bipeds! Three quintals are a crushing load for him; the steer of the meadow tosses him aloft like a waste rag. Nevertheless he can use tools, can devise tools; with these the granite mountain melts into light dust before him; he kneads glowing iron as if it were soft paste; seas are his smooth highway, winds and fire his unwearying steeds. Nowhere do you find him without tools; without tools he is nothing; with tools he is all. —*Thomas Carlyle.*

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DEPARTMENT OF BRIDGES

DEPARTMENT OF BRIDGES, Nos. 13 TO 21 PARK ROW, MANHATTAN, THE CITY OF NEW YORK, BOROUGH OF MANHATTAN.

Sealed bids or estimates will be received by the Commissioner of Bridges at the above office until 12 o'clock noon, on Wednesday, December 30, 1903, for the construction of three bascule bridges over Gowanus Canal, at Ninth Street, Third Street and Union Street, Borough of Brooklyn.

The work must be entirely completed on or before January 1, 1905.

The amount of security to guarantee the faithful performance of the work will be eighty thousand dollars ($80,000).

Blank forms and further information may be obtained at the Brooklyn office of the Department of Bridges, No. 179 Washington Street, Brooklyn.

GUSTAV LINDENTHAL, Commissioner of Bridges.

☞ See General Instructions to Bidders on the last page, last column, of the "City Record."

DEPARTMENT OF BRIDGES, Nos. 13 TO 21 PARK ROW, MANHATTAN, THE CITY OF NEW YORK, BOROUGH OF MANHATTAN.

Sealed bids or estimates will be received by the Commissioner of Bridges at the above office until 12 o'clock noon, on Wednesday, December 30, 1903, for the construction of a bascule bridge over Gowanus Canal, at Hamilton Avenue, Borough of Brooklyn.

The work must be entirely completed on or before May 1, 1905.

The amount of security to guarantee the faithful performance of the work will be forty thousand dollars ($40,000).

Blank forms and further information may be obtained at the Brooklyn office of the Department of Bridges, No. 179 Washington Street, Brooklyn.

GUSTAV LINDENTHAL, Commissioner of Bridges.

☞ See General Instructions to Bidders on the last page, last column, of the "City Record."

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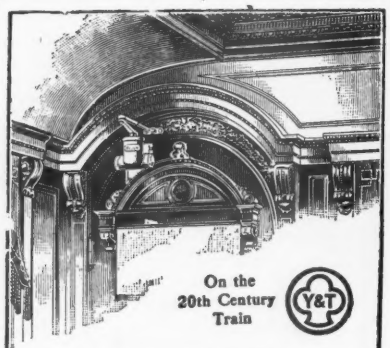

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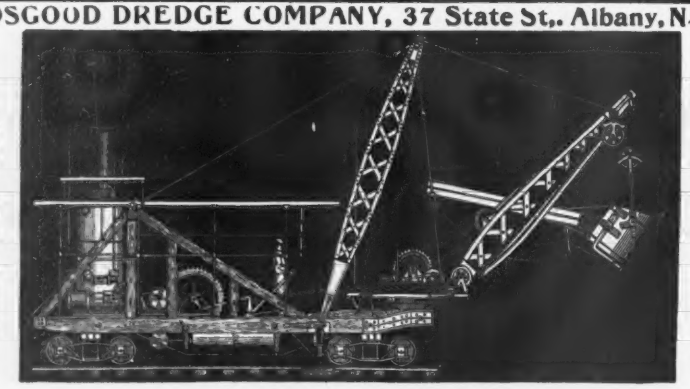

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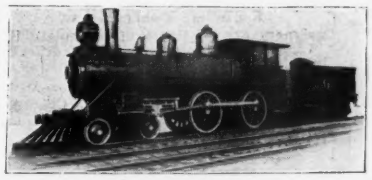

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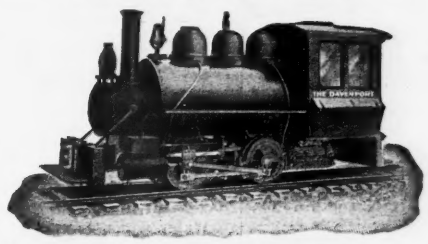

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Meetings and Conventions

MEETINGS AND CONVENTIONS OF RAILROAD ASSOCIATIONS AND ENGINEERING SOCIETIES WILL BE HELD AS FOLLOWS:

RAILROAD ASSOCIATIONS.

American Association of Dining Car Superintendents.—The next convention will be held in Chicago, Ill., Jan. 21, 1904. W. E. Meyers, Secretary, Chicago & Alton, Chicago, Ill.

American Association of General Baggage Agents.—Will meet at St. Louis, Mo., June 8. J. E. Quick (Grand Trunk), Secretary, Toronto, Ont.

American Railway Association.—Next meeting will be held in New York City April 27, 1904. W. F. Allen, Secretary, 24 Park Place, New York.

American Railway Engineering & Maintenance of Way Association.—The annual meeting will be held at Chicago, Ill., March 15, 16 and 17, 1904. L. C. Fritch, Secretary, Chicago, Ill.

American Railway Master Mechanics' Association.—The 1904 meeting will be held at Saratoga Springs, N. Y., June 22, 23 and 24. J. W. Taylor, Secretary, 667 Rookery, Chicago, Ill.

Association of Railway Telegraph Superintendents.—The annual meeting will be held at Indianapolis, Ind., June 15. P. W. Drew, Secretary, Milwaukee, Wis.

Freight Claim Association.—Will meet at Savannah, Ga., May 18. W. P. Taylor, Secretary, Richmond, Va.

Master Car Builders' Association.—The 1904 meeting will be held at Saratoga Springs, N. Y., June 22, 23 and 24. J. W. Taylor, Secretary, 667 Rookery Building, Chicago, Ill.

National Association of Railway Agents.—Will meet at St. Louis, Mo., June 21-24. N. A. Cottrell, Bismarck, Mo., Secretary.

Railway Transportation Association.—Next meeting Jan. 27, 1904, at Cincinnati, Ohio. G. P. Conard, Secretary, 24 Park Place, New York.

RAILROAD CLUBS.

Canadian Railway Club.—Meets at the Windsor Hotel, Montreal, Que., on the first Tuesday of each month at 8 p. m., excepting June, July and August. W. H. Rosevear, Jr., Secretary, Montreal.

Car Foremen's Association of Chicago.—Meets on the second Wednesday of each month at 8 p. m., 209 Masonic Temple. Aaron Kline, Secretary, 1146 Willard avenue, Chicago, Ill.

Central Railway Club.—Meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March, May, September and November, at 2 p. m. Harry D. Vought, Sec'y, 62 Liberty Street, New York.

Iowa Railway Club.—Meets on the third Tuesday of each month at place announced at previous meeting. P. B. Vermillion, Secretary, Union Station, Des Moines, Iowa.

New England Railroad Club.—Meets at Pierce Hall, Copley Square, Boston, Mass., on the second Monday of each month, except June, July, August and September. Edward L. Janes, Secretary, South Terminal Station, Boston, Mass.

New York Railroad Club.—Meets on the third Friday of each month at 8 p. m., excepting June, July and August, at 154 West 57th street(Carnegie Hall). F. M. Whyte, Mechanical Engineer of the New York Central & Hudson River Railroad, New York City, Secretary.

North West Railway Club.—Meets on the first Tuesday after the second Monday in each month, at 8 p. m., except June, July and August, the place of meeting alternating between the West Hotel, Minneapolis, and the Ryan Hotel, St. Paul. T. W. Flannagan, Storekeeper, "Soo Line," Minneapolis, Secretary.

Pacific Coast Railway Club.—Meets in San Francisco, Cal., on the third Saturday of each month. C. C. Borton, Secretary (S. P. Co.), West Oakland, Cal.

Railway Club of Pittsburg.—Meets at Hotel Henry at 8 p. m. on the fourth Friday of each month, except June, July and August. J. D. Conway, P. & L. E. R. R., Pittsburg, Pa., Secretary.

Railway Water Supply Association.—Meets on the first Sunday of each quarter at Alexander Hall, South Minneapolis, Minn. F. W. Hayden, Secretary, Glencoe, Minn.

Richmond Railroad Club.—Regular meetings are held on the second Thursday in each month except June, July and August, at 8 p. m., in Richmond, Va. F. O. Robinson, Chesapeake & Ohio Ry., Richmond, Secretary.

Rocky Mountain Railway Club.—Meets at the New St. James Hotel, Denver, Colo., on the first Saturday after the 15th of each month. J. E. Buell, Secretary, 906 Twelfth avenue, Denver.

St. Louis Railway Club.—Holds its regular meeting on the second Friday of each month, except July and August, at 8 p. m. E. A. Chenery, Secretary, Fourth Floor, Union Station, St. Louis.

Southern & Southwestern Railway Club.—Meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November. W. A. Love, Secretary, Atlanta, Ga.

Texas Railway Club.—Meets on the third Monday in April and September at place and time chosen at the previous meeting. T. H. Osborne, Secretary, Pine Bluff, Ark.

Transportation Club of Atlanta (Ga.).—F. A. Healy, Secretary.

Western Railway Club.—Meets on the third Tuesday of each month except June, July and August, in the Auditorium Hotel, Chicago, Ill. J. W. Taylor, Secretary, 667 Rookery Building, Chicago.

ENGINEERING SOCIETIES.

American Institute of Electrical Engineers.—Meets at 12 W. 31st street, New York, on the fourth Friday of each month, except June, July and August. Ralph W. Pope, Secretary, 95 Liberty street, New York.

American Society of Civil Engineers.—Meets at the house of the Society, 220 W. 57th street, New York City, on the first and third Wednesdays in each month at 8:30 p. m., except in July and August. C. W. Hunt, Secretary, 220 W. 57th street, New York.

American Society of Mechanical Engineers.—The annual meeting is held on the first Tuesday in December, each year, in New York City. Prof. F. R. Hutton, Secretary, 12 W. 31st street, New York.

Boston Society of Civil Engineers.—Meets at Chipman Hall, Tremont Temple, Boston, on the fourth Wednesday in January and on the third Wednesday of the other months, except July and August. S. E. Tinkham, Secretary, 60 City Hall.

Canadian Society of Civil Engineers.—Meets at its rooms, 877 Dorchester street, Montreal, P. Q., every alternate Thursday, at 8 p. m., from October to May, inclusive. C. H. McLeod, Secretary.

Chicago Electrical Association.—Meets on the first Friday of each month, from October to May, at 8 p. m., at 1737 Monadnock Block, Chicago. W. J. Warder, Jr., 900 Warren avenue, Secretary.

Civil Engineers' Club of Cleveland.—Meets at 689 The Arcade, Cleveland, Ohio, on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month. Arthur A. Skeels, Secretary, 689 The Arcade.

Civil Engineers' Society of St. Paul.—Meets on the second Monday of each month. G. S. Edmondstone, City Bridge Engineer, St. Paul, Minn., Secretary.

Engineering Association of the South.—Meets in the Berry Block, Nashville, Tenn., on the second Thursday of each month. Robert L. Lind, Secretary, 2102 Hayes street, Nashville, Tenn.

Engineers' Club of Chicago.—Meets on the first and third Tuesday evening of each month in Jefferson Hall, 70 Adams street. B. W. Thurtell, Secretary, 1223 New York Life Building, Chicago.

Engineers' Club of Cincinnati.—Meets at the rooms of the Literary Club, 25 East Eighth street, on the third Thursday of each month, excepting July and August, at 6 p. m. J. F. Wilson, Secretary, P. O. Box 333, Cincinnati, Ohio.

Engineers' Club of Columbus (Ohio).—Meets at 12½ North High street on thte first and third Saturdays of October, November, December, January, February and March, and on the third Saturday of April, May, June and September. H. M. Gates, 12½ North High street, Secretary, Columbus, Ohio.

Engineers' Club of Minneapolis.—Meets on the third Monday of each month except July and August, at their room in the County Commissioner's Offices, Court House, Minneapolis. Jas. B. Gilman, Secretary, Am. Bridge Co.

Engineers' Club of Philadelphia.—Meets at the house of the Club, 1122 Girard street, Philadelphia, Pa., on the first and third Saturdays of each month at 8 p. m., except during July and August. J. O. Clarke, Secretary.

Engineers' Club of St. Louis.—Meets at 709 Pine steet, St. Louis, on the first and third Wednesdays in each month. H. J. Pfeifer, Secretary, Fullerton Bldg.

Engineers' Society of Western New York.—Holds regular meetings on the first Tuesday in each month, except in the months of July and August, at the Buffalo Library Bldg. Lee W. Elghmy, Sec'y, 533 Ellicott Sq.

Engineers' Society of Western Pennsylvania.—Meets at 410 Penn avenue, Pittsburgh, Pa., on the third Tuesday in each month, at 7.30 p. m. Chas. W. Ridinger, Secretary, 410 Penn avenue, Pittsburg.

Franklin Institute.—The general Institute meeting is held at 8 p. m. on the third Wednesday of each month, except July and August, at 15 South Seventh street, Philadelphia, Pa. The Mechanical and Engineering section meets on the second Thursday of each month (except July and August), at 8 p. m. Wm. H. Wahl, Secretary.

Montana Society of Civil Engineers.—Meets in Butte, Mont., on the second Saturday in each month at 8.30 p. m. Clinton H. Moore, Secretary.

Pacific, Northwest Society of Engineers.—Meets monthly in the Chamber of Commerce rooms, at Seattle, Wash.

Technical Society of the Pacific Coast.—Meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m. Otto Von Goldern, Secretary, 89 Flood Bldg.

Western Society of Engineers.—Meets in the Society Hall in the Monadnock Block, Chicago, Ill., on the first Wednesday of each month, except in January, July and August. Special meetings are held on the third Wednesday of each month. J. H. Warder, Secretary.

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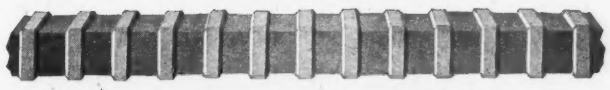

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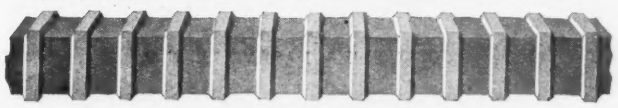

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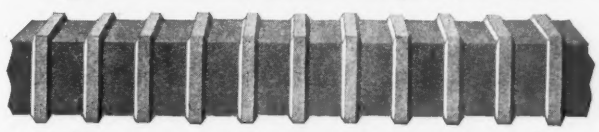

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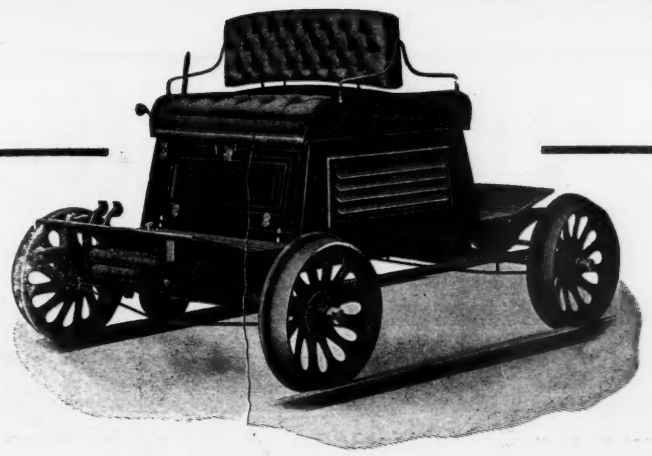

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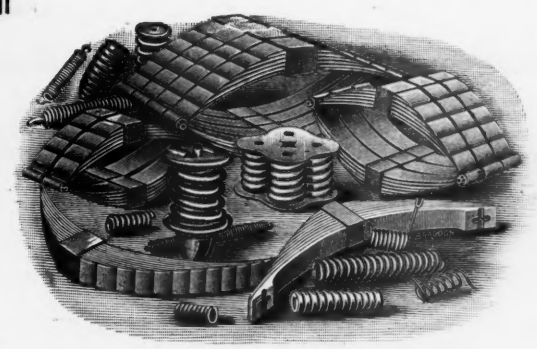

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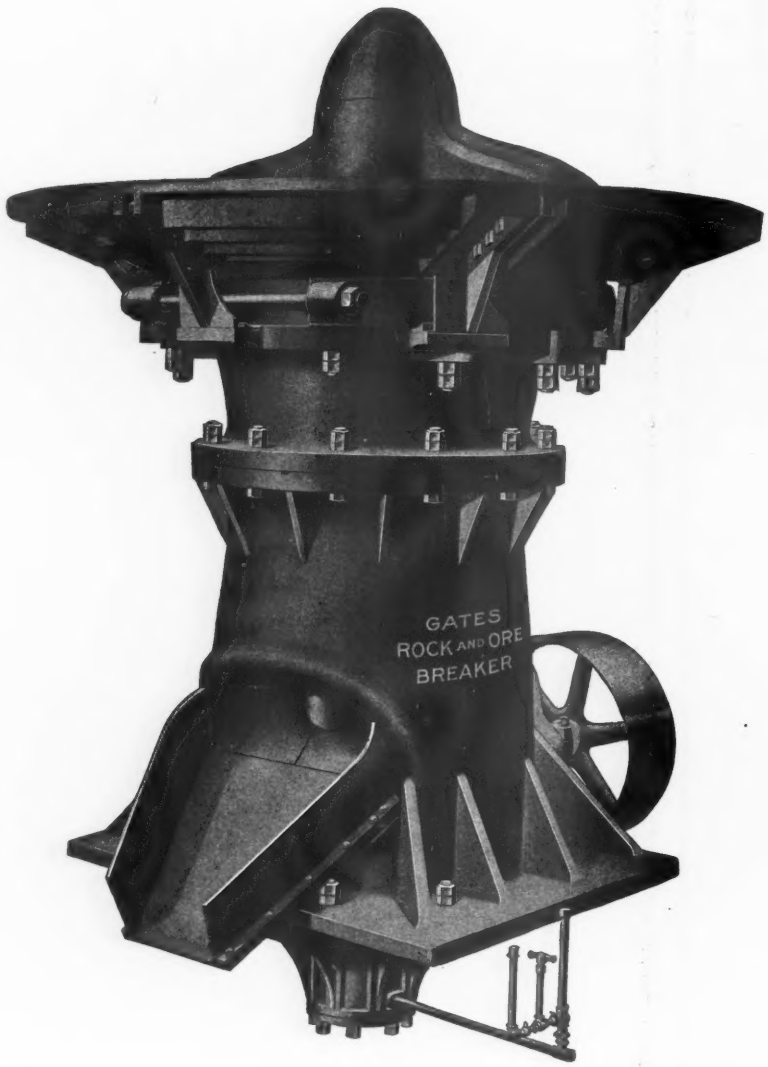

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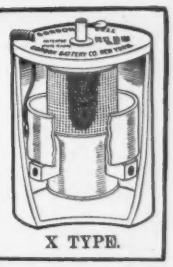
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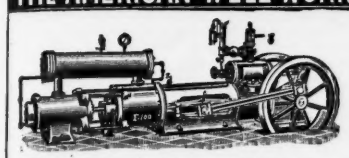

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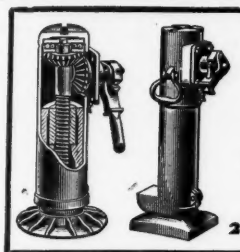

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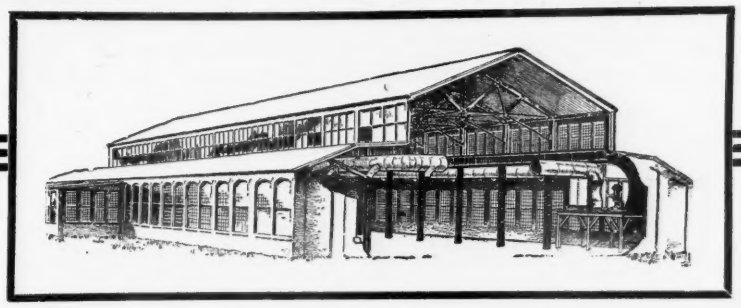

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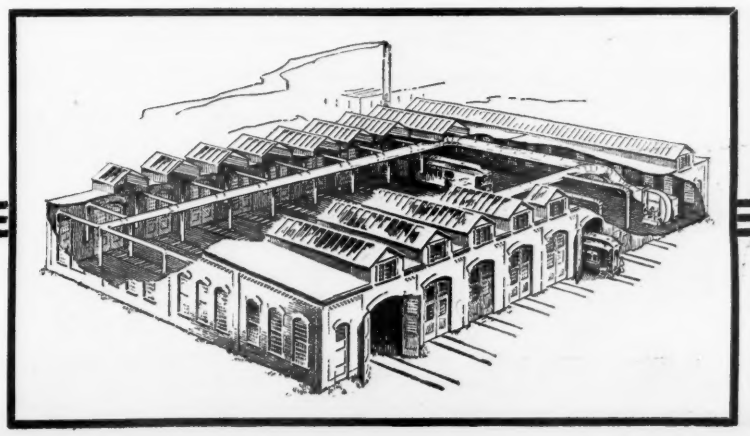

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this material is unequalled. Unlike its cellulose imitations, Pantasote is not dangerous; imitations can be detected by applying a lighted match to their surfaces; PANTASOTE WILL NOT BURN! It is Fireproof as well as Waterproof, Greaseproof and Stainproof, and can be cleansed with soap and water. Looks exactly like Morocco, wears better, costs half; will not rot, crack or stiffen, and is not affected by heat, cold or weather. Tested ten years by leading railways. Made in plain leather grains or richly embossed patterns, all standard colors. Genuine has "Pantasote" stamped on goods. Samples and prices on request.

THE PANTASOTE CO.

11 BROADWAY, NEW YORK CITY

2¢ **SAVES** $$$$

A TWO CENT STAMP SAVES MONEY WHEN ATTACHED TO AN INQUIRY ABOUT OUR

ASBESTOS AND MAGNESIA PRODUCTS

ALL MONEY SAVERS

Take our **ASBESTOS PACKINGS**, for instance, they meet the severest conditions and prevent expensive delays for repacking. Their remarkable durability makes them the most economical.

Then our **ASBESTOS & MAGNESIA PIPE & BOILER COVERINGS** stop useless radiation, reduce coal bills and increase efficiency.

KEYSTONE HAIR INSULATOR is an ideal structural insulator, sound deadener and cold preserver Keeps buildings warm in winter, cool in summer. Invaluable in cold storage plants, refrigerator cars, etc. Saves its cost every winter in coal bills. Fire, water and vermin proof.

As for our **ASBESTOS ROOFINGS**,—the U. S. Government has just purchased 3,028,320 square feet and Uncle Sam who is a pretty good judge says officially that it is "better than the others." Fire proof, entirely mineral and adapted to all climates

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No Expensive Foundations
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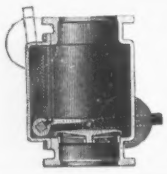
JONES CAR DOOR CO.

MONADNOCK BLOCK CHICAGO

BOUND VOLUMES
of THE RAILROAD GAZETTE
$6.00 per Volume.



Excelsior Straightway Back Pressure Valve

is simple in construction and well made. Being fitted with the Jenkins Disc, it is noiseless and never sticks. Gives long service, and can be relied upon at all times. Can be quickly thrown in and out of use without taking valve apart. It offers no resistance to the steam when wide open.

JENKINS BROS., New York, Boston, Philadelphia, Chicago, London.

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ERECTED COMPLETE OF ANY CAPACITY. SPECIAL DESIGNS TO MEET LOCAL CONDITIONS. RESULTS GUARANTEED.

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Superior in Quality of material and workmanship, and with greatest efficiency and durability, they challenge comparison with any others on the market.

Send a trial order subject to approval only if satisfactory, and thereby prove the claims made for them. HIGH GRADE GOODS OUR EXCLUSIVE SPECIALTY.

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For transporting material in railway machine shops.

For handling package and bag freight on wharves. Cars, tracks, switches and turntables, in stock for prompt shipment.

Send for Catalogue 039, which contains a special offer, whereby a trial of this system can be made without charge.

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USED BY 80 PER CENT. OF AMERICA'S RAILROADS.

WATCHMAN'S IMPROVED TIME DETECTORS

E. IMHAUSER & CO.
206 Broadway, New York

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CLEVELAND, OHIO.

CATECHISM OF THE LOCOMOTIVE

PRICE, $3.50

RAILROAD GAZETTE, 83 Fulton Street, NEW YORK

THE **"DAMASCUS"**

IS THE

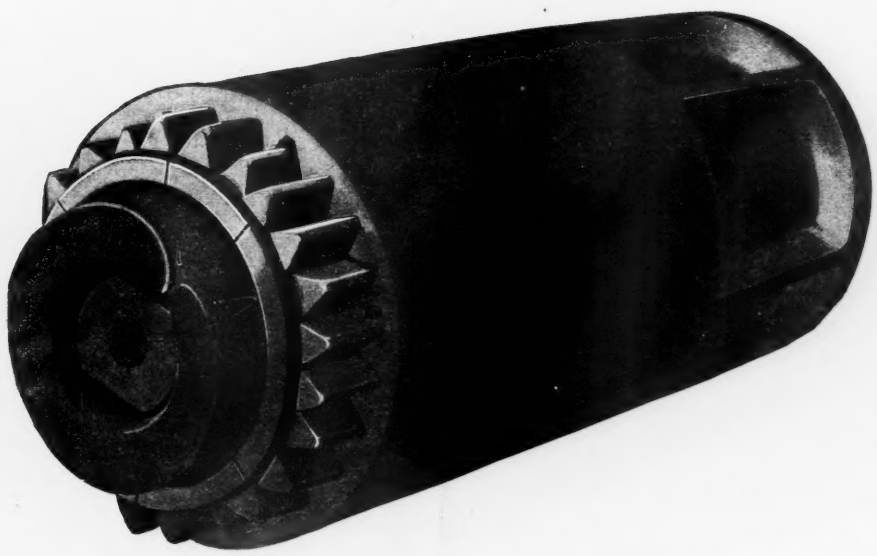
BEST BRAKE BEAM

ON THE MARKET

DAMASCUS BRAKE BEAM CO., ST. LOUIS

Westinghouse Friction Draft Gear

Its efficiency equals the tractive effort of three powerful locomotives



Exterior Perspective View of the Westinghouse Friction Draft Gear.

Practically eliminates damages to draft-rigging due to shocks and strains in handling long and heavy trains.

Manufactured by

The Westinghouse Air Brake Co.

Pittsburg, Pa.

Builders of The Air Brake.

Westinghouse Motors

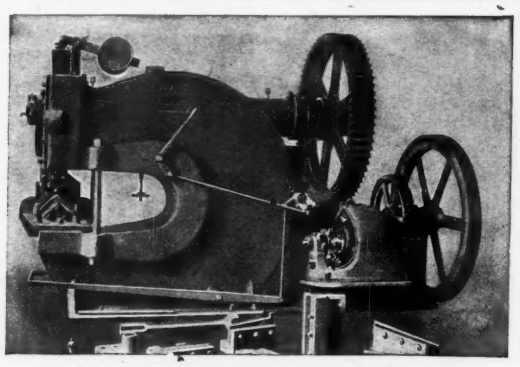
Alternating and Direct Current

Solve every problem of economical
Electric Power Application.

Circulars 1042 and 1050 for particulars.

Westinghouse Electric & Mfg. Co.

Sales Offices in all Large Cities. Pittsburg, Pa.



Westinghouse Multipolar Motor Driving Throat Punch.

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PUSH CARS, EARTH MOVING CARS, ETC.

Pneumatic and Mechanical
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Works at HARVEY, COOK CO., ILL.

A WONDERFUL AID TO SOLDERERS!

YAGER'S SOLDERING SALTS

WARRANTED TO EXCEL ALL OTHER PREPARATIONS
for Soldering Tin, Copper, Brass, Iron and *all other metals!*

CHEAPER THAN ACID! BETTER THAN RESIN!

A dry salt, simply add a little water and can be used at once. Leaves the metal bright and clean and causes the solder to flow more evenly.

Does not injure the iron, like acid, and is *unexcelled for tinning* them! Can be used on damp surfaces!

Free sample upon request. And ask for special descriptive circular No. 1131.

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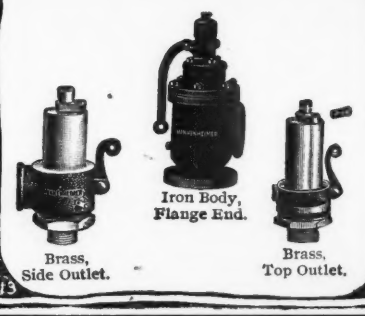
THE LUNKENHEIMER POP SAFETY VALVES

for STATIONARY, PORTABLE & MARINE STEAM BOILERS



Are made of the best materials, provided with large springs, have full relieving capacity and always prompt and reliable in operation. In brass top or angle outlet, ¾ inch to 3 inches; in iron, brass mounted, screw or flange ends, 2 inches to 6 inches. Also furnished with nickel seats, if desired. All valves rigidly tested and inspected and warranted to satisfy. Specify *Lunkenheimer* make and order from your dealer.

Write for catalogue of Superior Brass and Iron Engineering Appliances.

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THE ASHCROFT LOCOMOTIVE STEAM GAUGES

have non-corrosive movements. The Springs are made from seamless drawn tubing which is especially prepared and highly tempered.

THEY ARE ABSOLUTELY ACCURATE

In order to get the genuine look for our trade-mark, it is stamped on each Gauge.

OUR BOOK FOR THE ASKING.

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STEEL ROLLING DOORS AND SHUTTERS FOR FREIGHT AND ROUND HOUSES ETC.

MEET EVERY REQUIREMENT · OPERATE WITH EASE AND SPEED

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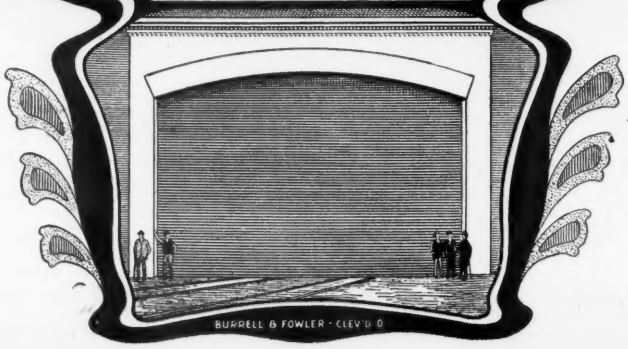

AIR BRAKES

THE CORRINGTON ALTERNATE QUICK ACTING BRAKE SYSTEM

Railroads are protected in the adoption and use of our Consolidated Valve and the Alternate System, by the American and Foreign patents which this company owns and controls, and in the allowance of which the patent office has ruled that the Consolidated Valve is fundamentally and entirely new, and, when used in connection with the present car equipment, provides a fundamentally and entirely new system of braking for the continuous or intermittent control of trains.

THE CORRINGTON AIR BRAKE COMPANY

MAIN OFFICE AND WORKS, MATTEAWAN, NEW YORK

THE HALL SIGNAL COMPANY.

Some Instructive Statements.

Of all the independent power automatic block signals, installed in the United States, 57 per cent. are Hall signals.

Of all the automatic block signals in the United States, installed by THE HALL SIGNAL COMPANY, 69 per cent. are normal danger.

Of all the independent power automatic block signals installed since January 1, 1903, more than 55 per cent. are Hall electro-gas.

The number of the new Hall electro-gas signals installed or on order is already over 1,500.

THE HALL SIGNAL COMPANY has developed the electro-gas semaphore signal. This is the simplest, most economical and most reliable automatic signal yet invented and the basic patent for "*every possible operative form of a liquefied gas signal*" has been issued to this Company.

THE HALL SIGNAL COMPANY installs automatic signals on either the normal danger or the normal clear plans. The normal danger system for signals on a track circuit, the exclusive patents for which are owned by this Company, is logically the safest and most economical method of operation.

THE HALL SIGNAL COMPANY also furnishes the well-known Hall Disc signal and the all-electric motor semaphore signal. The new dust proof track relays, lightning arresters, electric switch locks, electric slots, switch instruments, etc., manufactured by the Hall Company are the most nearly perfect signal material known to the art.

THE HALL SIGNAL COMPANY,

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Cold Drawn Seamless Tubes

FOR

LOCOMOTIVE BOILERS

ARCH PIPE STAY TUBES
SAFE ENDS
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Successor to GALENA OIL COMPANY AND SIGNAL OIL COMPANY,

Sole Manufacturers of the Celebrated

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SOLE MANUFACTURERS OF FRED.G.WEIR'S IMPROVED RIGID & SPRING FROGS, CROSSINGS SINGLE & THREE THROW SPLIT SWITCHES. FIXED & AUTOMATIC SWITCH STANDS. STEEL DIE FORMED RAIL BRACES, SWITCH FIXTURES, ETC

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Iron and Steel Castings

High Speed Brakes require

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Manufacturers of all varieties of

Iron and Steel Sheets
Black and Galvanized
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Flat, Corrugated and
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W. Dewees Wood Company's Patent Planished Iron
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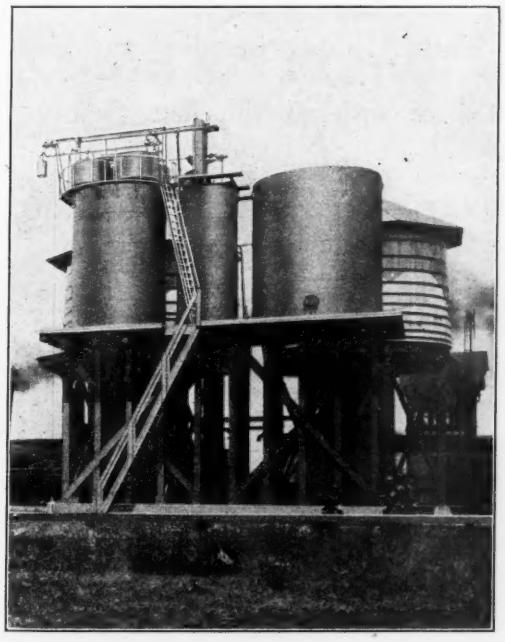
Wellsville Polished Steel Sheets

PENNSYLVANIA LINES WEST OF PITTSBURGH

MIDDLEPOINT, OHIO



Send for description of this 10,000 gallon per hour Water Softening machine.

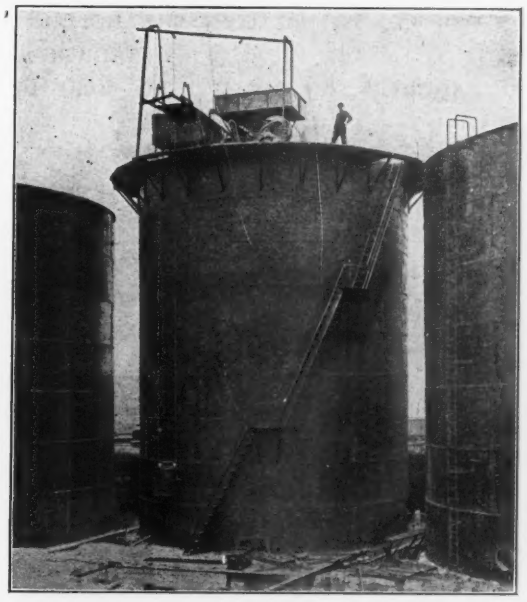
INDUSTRIAL WATER COMPANY

126 LIBERTY ST., NEW YORK

KENNICOTT WATER SOFTENER

at P. & L. E. R. R. Shops, McKEES ROCKS, PA.

One of ten Kennicott softeners on P. & L. E. R. R. The two steel storage tanks on either side of softener have a capacity of 500,000 gallons each.



This is the largest continuous water softening plant in the world, having a daily softening capacity of 1,440,000 gallons.

KENNICOTT WATER SOFTENER CO.

806 Great Northern Building RAILROAD DEPT CHICAGO
29 Great Saint Helens, London, E. C., Eng. Cable Address: "Watersoft," London

TWEEDDALE WATER SOFTENING SYSTEM.

SIMPLEST OF ALL SYSTEMS. CHEAPEST TO OPERATE.

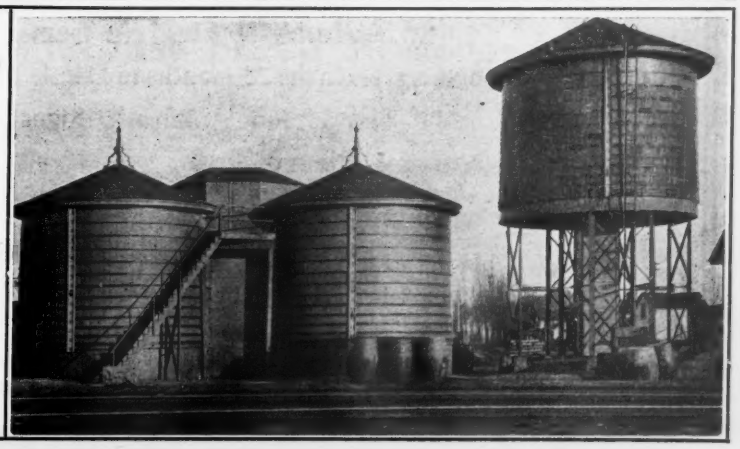
The International Harvester Company writes:

Dear Sir: On September last we contracted with you for a trial plant of the Tweeddale patent water softening system for the South Chicago Furnace. Said plant was guaranteed to prevent the formation of scale in boilers and the removal of the old scale. The duration of trial was six months. It was entirely satisfactory and we have awarded you contract to install the system for our new blast furnace and also steel works at South Chicago to supply water for 10,000 H. P. boilers.

Yours truly,
International Harvester Company, (Deering Division).

Edes Clarke

Cut shows one of four systems erected for Chicago, St. Paul, Minneapolis and Omaha Railway.



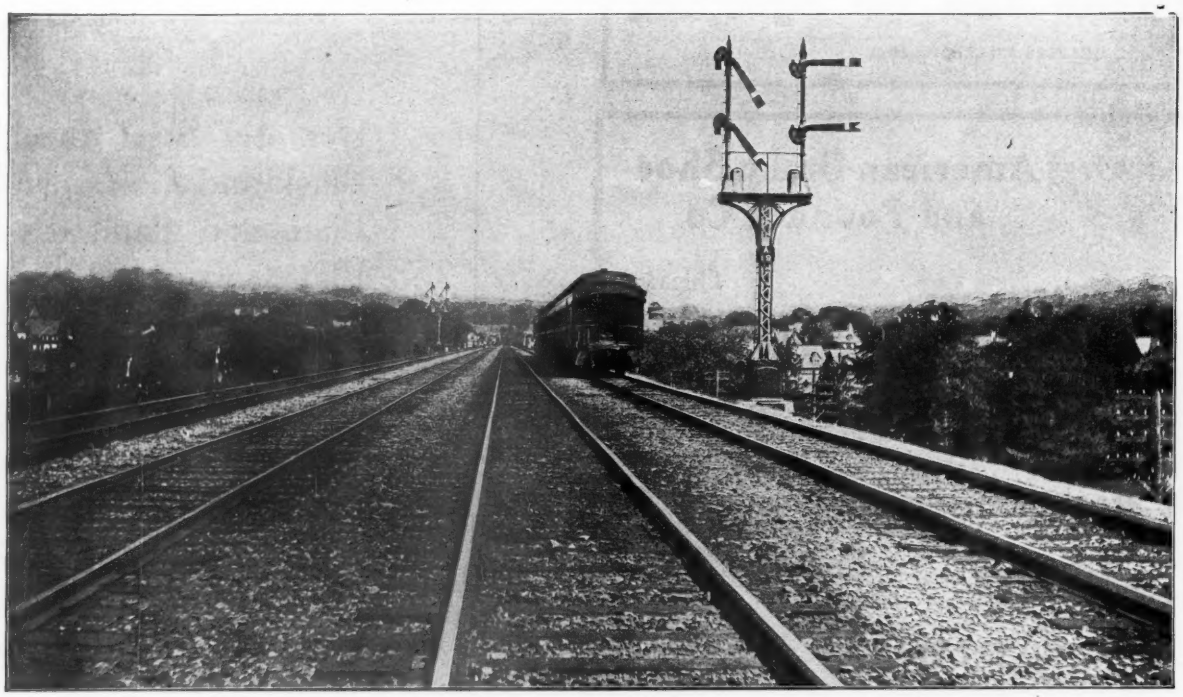
TWEEDDALE WATER SOFTENING CO., Fisher Building, Chicago.

The Union Switch & Signal Co.,

of Pittsburg, Pa.

General Office and Works **Swissvale, Pa., U. S. A.**

New York Office, Central Bldg., 143 Liberty St. St. Louis Office, Terminal Station Chicago Office, Monadnock Block



SOME SUGGESTIVE FIGURES

Of all the Automatic Block Signals in the United States, installed and on order, 62 per cent. are *Union.*

Of all the Automatic Block Signals in the United States, installed and on order, 72 per cent. are normal clear.

Of all the Automatic Block Signals installed or ordered the last twenty months, 8¼ are normal clear to 1 normal danger.

The Union Switch and Signal Co. designs, makes and installs **Block Signals** and **Interlocking.**

Manufactures **Frogs, Switches** and **Crossings** of standard and special designs.

INTERLOCKING

The Westinghouse Electro Pneumatic is much the best power interlocking ever devised. No other system combines so many good qualities in so great degree.

Electric Interlocking: There are situations where the electro-pneumatic system is relatively costly. For such situations the Union Company now offers an electric system.

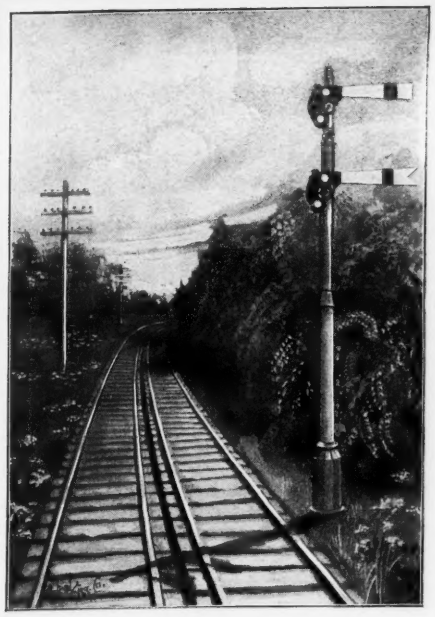
BLOCK SIGNALING

The Union Switch and Signal Company has now in service or on order **4,660 Automatic Electric Semaphore Signals.** The increase in Union Signals of this style in the 26 months to Dec. 1, 1903, was one hundred and sixty-two per cent. (162%)

The Union Automatic Signals in service and on order number 10,250, all **Normal Clear.**

ELECTRO-GAS SIGNALS

The **Union Gas Motor** Semaphore Signal is fully protected by three patents issued to J. P. Coleman, November 24, 1903, and assigned to the Union Company.

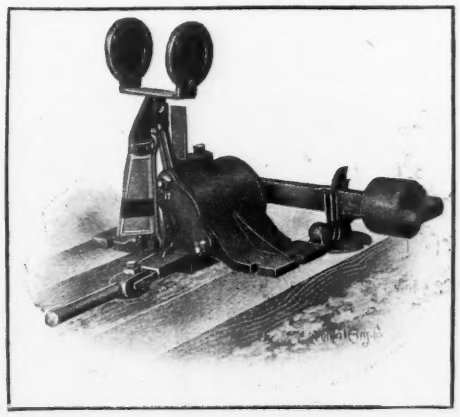


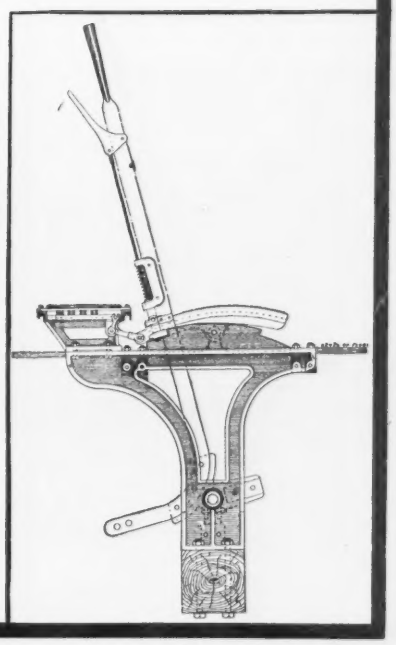
THE MEDRIC COMPANY

SIGNALING

960 Rose Building, CLEVELAND, O.

WORKS: WEST SIDE





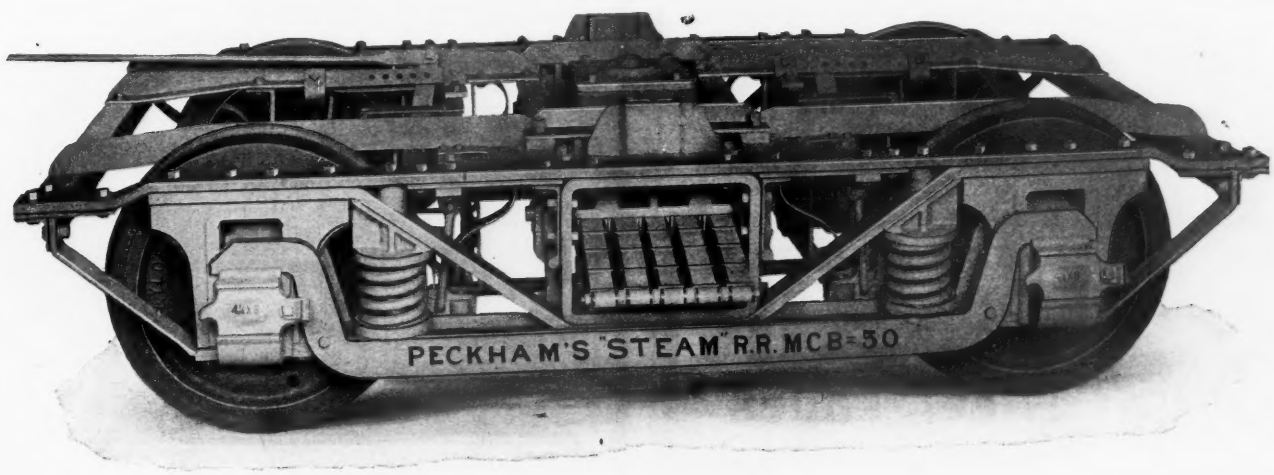
MODERN SIGNALS AND SAFETY APPLIANCES

INTERLOCKING, MANUAL,
ELECTRIC, AUTOMATIC,
BLOCK, CROSSING ALARMS.

Odenkirk Switch Stands. High, Intermediate, Low.

Peckham's (Patent) "all Steel" HIGH SPEED Truck
M. C. B. - 50.

DESIGNED EXPRESSLY FOR STEAM RAILWAY PASSENGER CARS.



Constructed in accordance with Master Car Builder's specifications.
Equipped with **Master Car Builder's Standard Journal Boxes, Brasses, Springs and Brakes,**
Constructed "absolutely square" and so braced that it can not get out of alignment.
The Only "All Steel" M. C. B. Passenger Car Truck.

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WORKS—PORTSMOUTH, VA. ESTABLISHED 1881 OFFICE—STAMFORD, CONN.

We have one of the best creosoting plants in the United States, situated on the Norfolk Harbor and with Railroad Connections. We Creosote Lumber, Piles, Wharf and Bridge Timbers, Telegraph Poles and Cross Arms, R. R. Ties, and are manufacturers of Cross Arms and **WYCKOFF CONDUITS** for underground wires.

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Advice on operation; improvement of old plants.
Specifications for timber treatment.

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SOUTHERN CREOSOTING COMPANY, Ltd.

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Twenty-eight miles from New Orleans, La., surrounded by the finest timber lands in the South.

Facilities for shipping by water and rail. CREOSOTED TIES, TELEGRAPH POLES, CROSS ARMS, TIMBER, PILES AND PAVING BLOCKS. Capacity 22,000,000 feet per annum. A. B. C. code used. Cable address Creosote, Slidell, La. Send for catalogue. E. H. BOWSER, General Manager.

West Pascagoula Creosoting Works

West Pascagoula, Miss., U. S. A.

Situated on Pascagoula Bay and on the line of the Louisville & Nashville Railroad. Established 1875. Orders for creosoted piles, telegraph poles, cross-arms, electric conduits, paving blocks, sawed ties and timber, promptly executed. Cylinders 120 feet long. Capacity one million feet per month. A. B. C. code used. Cable address, Pierre, West Pascagoula, Miss. Address Jno. B. LINDSEY, Supt.

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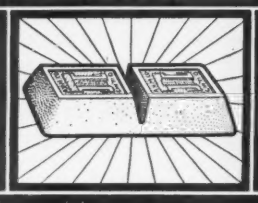
BRASS·PHOSPHOR BRONZE & GUN METAL CASTINGS

WM. PORTEUS PERFECT GRAPHITE FRICTIONLESS BABBITT METALS



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Manufacturers and Wholesale Dealers in

LONG LEAF YELLOW PINE ROUGH AND DRESSED

CAR SILLS AND BRIDGE TIMBERS A SPECIALTY

Macon, Ga.

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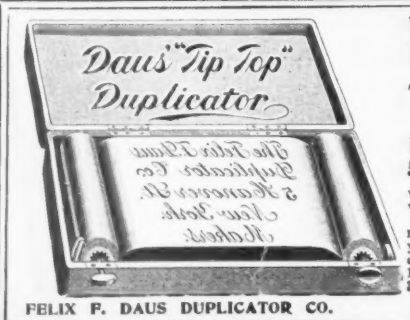
LUFKIN Steel Tapes

ARE INDISPENSABLE FOR ACCURATE WORK

MADE BY **The Lufkin Rule Co., - - Saginaw, Mich.**

For Sale Everywhere. Send for Catalogue.



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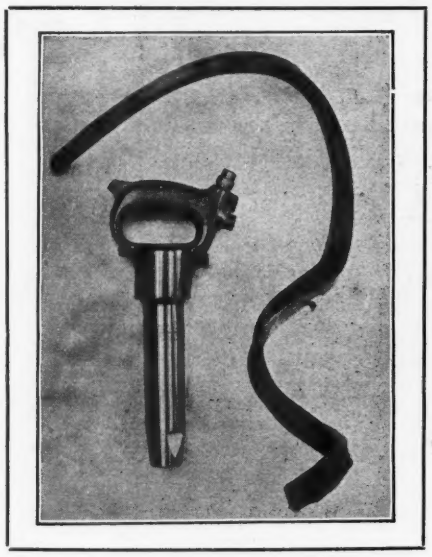
TO PROVE that Daus' "Tip-Top" Duplicator is the best, simplest, and cheapest device for making

100 copies from Pen-written and 50 copies from Typewritten original

we are willing to send a complete "Duplicator" **without deposit on 10 days' trial.**

No mechanism to get out of order, no washing, no press, no printer's ink. The product of 23 years' experience in Duplicators. Price for complete apparatus, cap size (prints 8 3-4 in. by 13 in.), $7.50, subject to the trade discount of 33 1-3 per cent., or **$5.00 net.**

FELIX F. DAUS DUPLICATOR CO. Daus Building, 111 John St., New York



"Next to Head"

You've heard of the school-boy who told his mother that he was "next to head" in his class. There were just two in the class.

It's a bad job to get pneumatic tools that are "next to head."

Keller Pneumatic Tools

have been "head" from the beginning, and they increase their lead every year. No other make compares with them in speed or endurance. While other tools are being repaired, Keller Tools are doing the work of both. Although they cost more, everybody knows that they are the cheapest pneumatic tools made.

Write for our new catalogue and booklet on the "Care and Use of Pneumatic Tools."

PHILADELPHIA PNEUMATIC TOOL CO.,

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PHILADELPHIA.

NEW YORK CHICAGO PITTSBURGH

SAN FRANCISCO BOSTON

Our RUBBER GOODS

BOSTON BELTING COMPANY · ESTABLISHED 1828 · TRADE MARK

are carefully and thoroughly made of the best materials. They are reliable and satisfactory in service, — durable and economical. They are used by the leading railways. . . . . .

When it's about Rubber ask us · BOSTON BELTING CO. BOSTON

AIR BRAKE, GAS, WATER, STEAM, SUCTION, FIRE, AND PNEUMATIC

HOSE

BELTING
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DIAPHRAGMS

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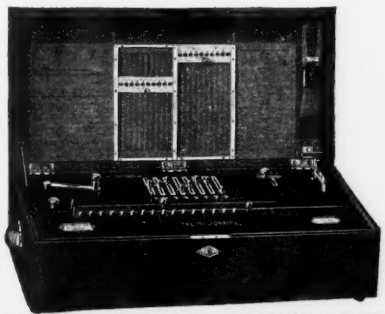

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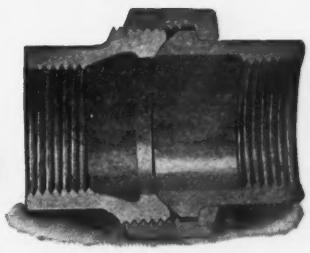

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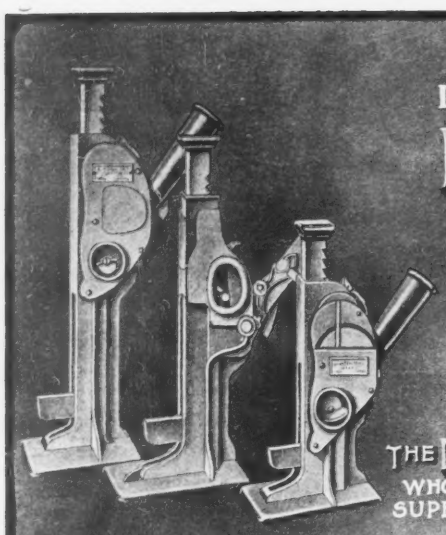

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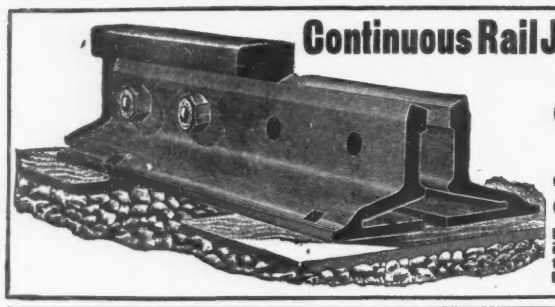

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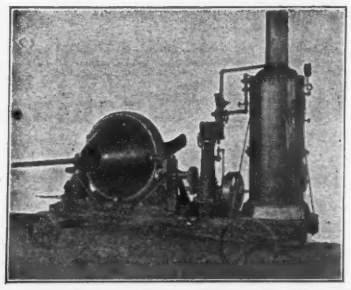

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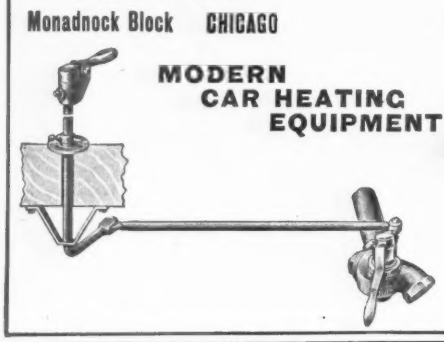

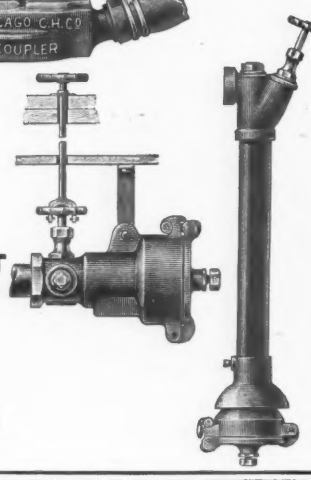

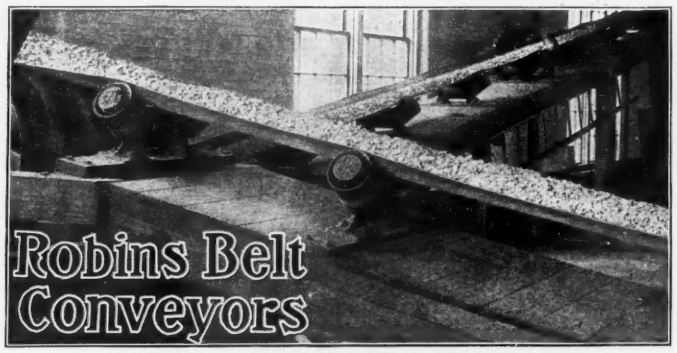

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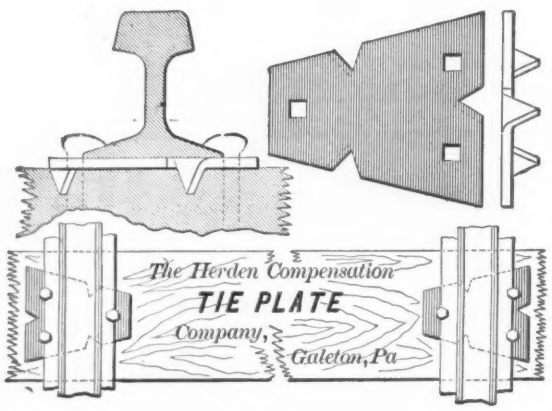

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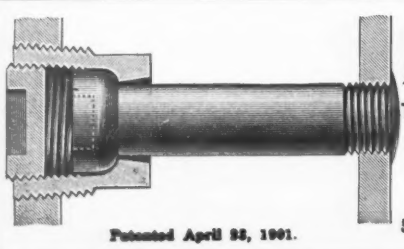

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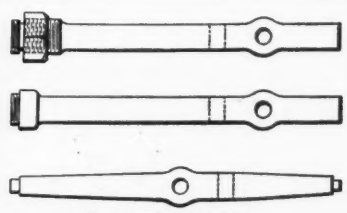

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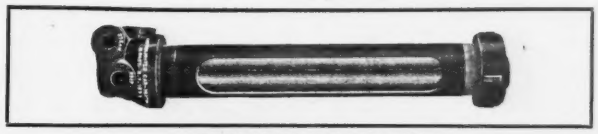

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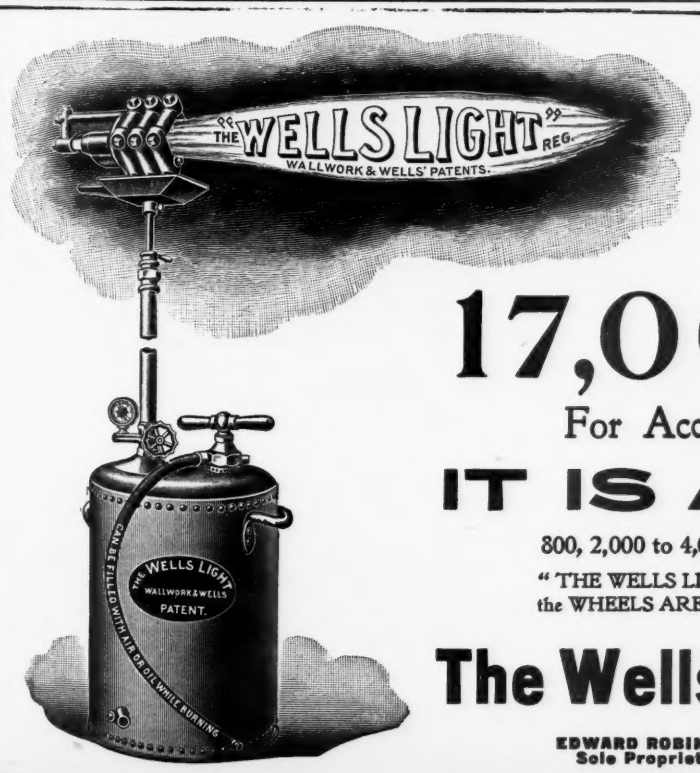
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3.00 P. M.—"The Atlantic Express," Fort Wayne Route, no Extra Fare, Dining Cars. Sleeping Cars from Chicago to Washington and New York. Due Washington 7.15 P. M.; New York, 8.15 P. M.

6.00 P. M.—"The Pennsylvania Limited," Fort Wayne Route. Extra Fare Train. A solid train of Dining, Sleeping, Library, Smoking and Observation Cars from Chicago to New York, via Broad Street Station, Philadelphia. Connects at Harrisburg with Parlor Car train for Baltimore and Washington. Due Washington 5.10 P. M., New York 6 P. M.

9.00 P. M.—"The Eastern Express," Pan-Handle Route. No Extra Fare. Connects through via Columbus and Pittsburgh to various Eastern points.

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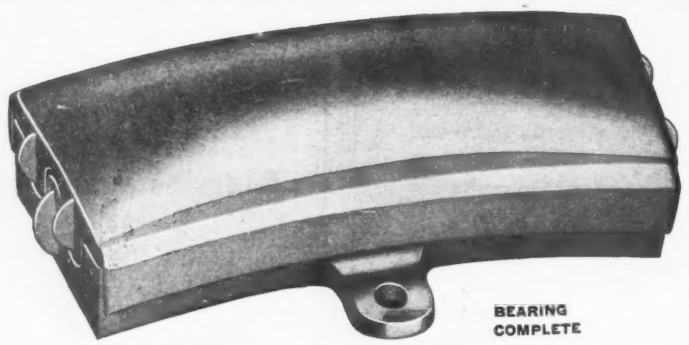

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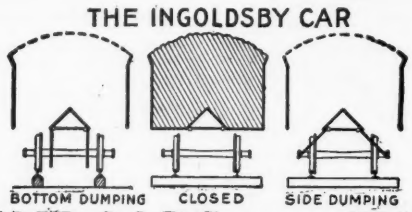

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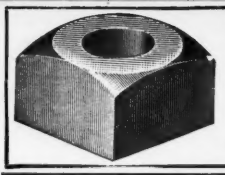

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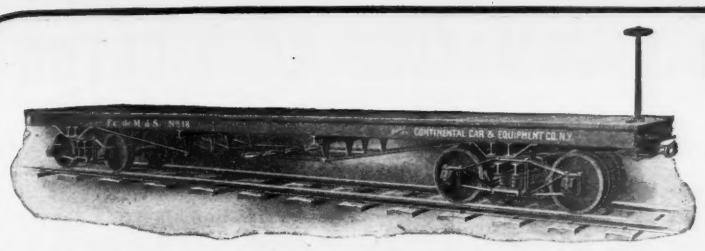

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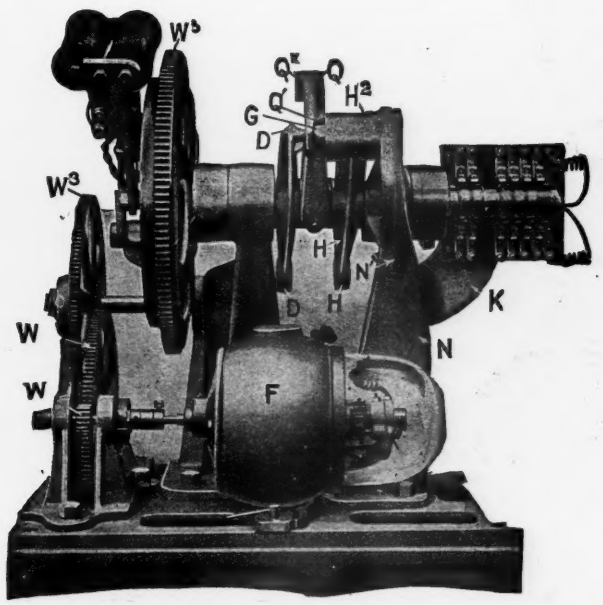

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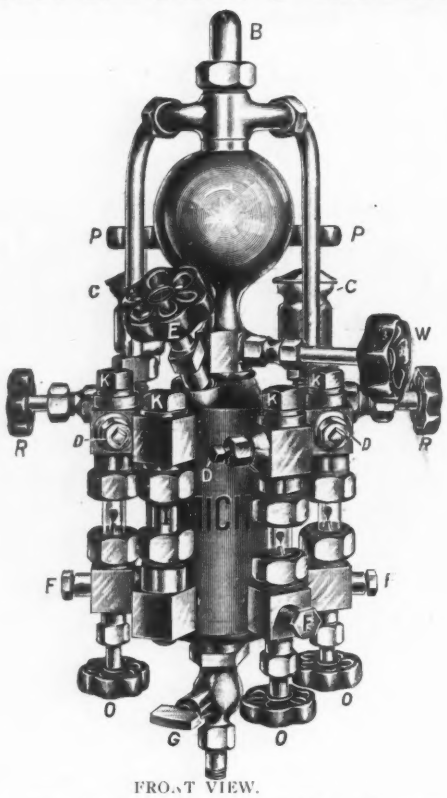


FRONT VIEW.

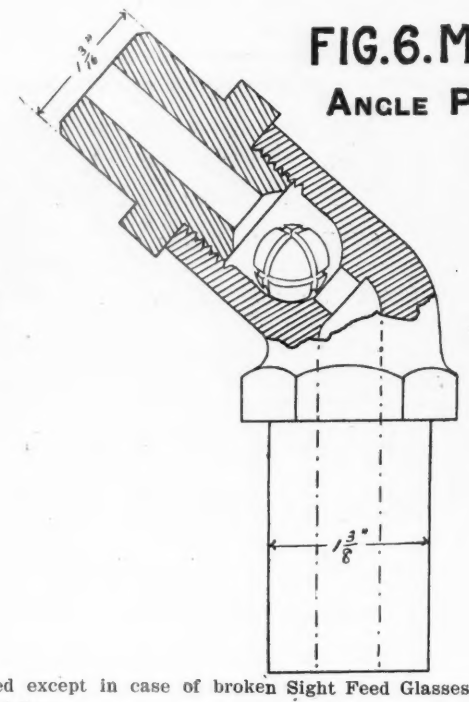
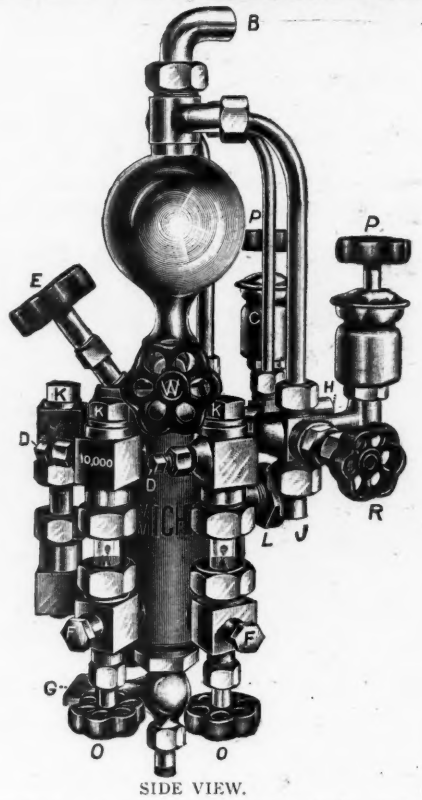


FIG. 6. M. LONG
ANGLE PLUGS



SIDE VIEW.

The **By-Pass Valves** are NOT to be operated except in case of broken Sight Feed Glasses, and then only for the purpose of permitting a new Glass to fill with water. Their operation is as follows:

When Glass breaks the Ball Valve seats, preventing steam blowing out through the Sight Feed Connections to cause injury. This allows Lubricator Glass to be replaced without closing Regulating Feed Valves o-o-o, except the one at the broken Glass, or closing the Lubricator off from the Boiler, or closing the Throttle.

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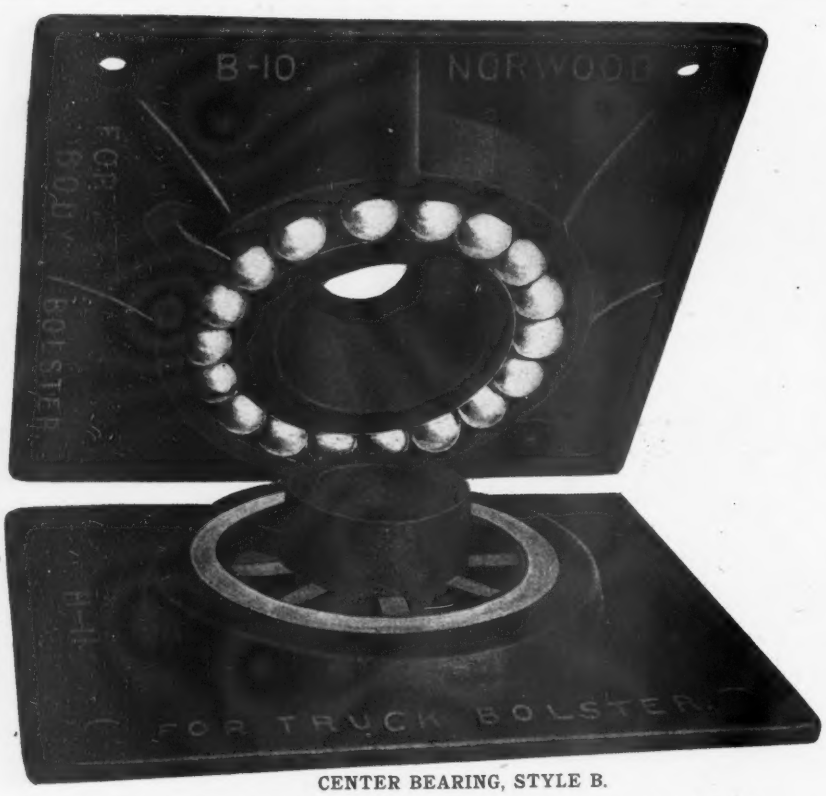

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In a test made by Committee appointed by Master Car Builders Association, 1903, this was the only Center Bearing to turn under a load of 37 tons without cutting. Flange pressure 58 lbs.

Extreme simplicity and reliability are noteworthy features.

Built on the best scientific principles

No loose parts to get out of order.

Balls are suspended and cannot clog.

Fitted by special machinery and all parts interchangeable.

Grooved race plates give each ball about 3-4″ contact surface, making a total contact surface of about 3″ on the Side Bearing and about 14″ on the Center Bearing.

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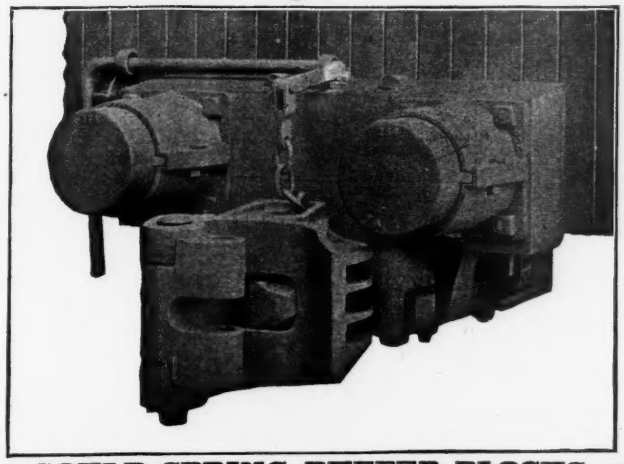
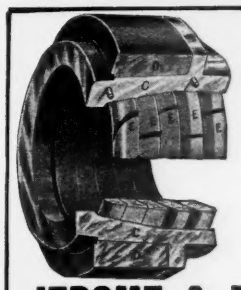


GOULD SPRING BUFFER BLOCKS AND GOULD FREIGHT CAR COUPLER



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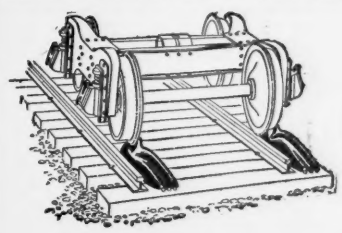

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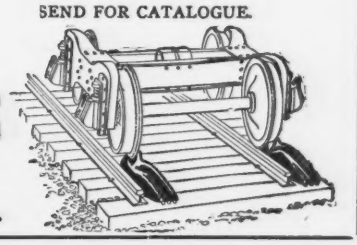

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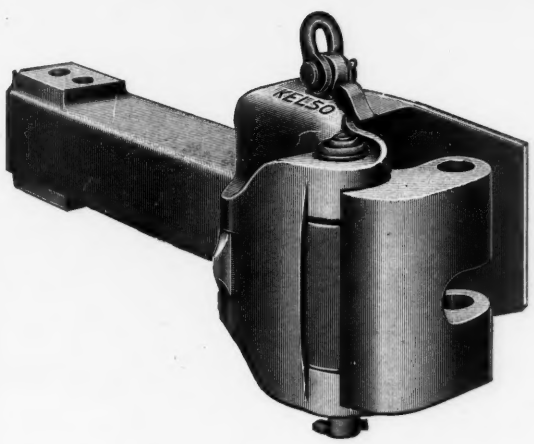

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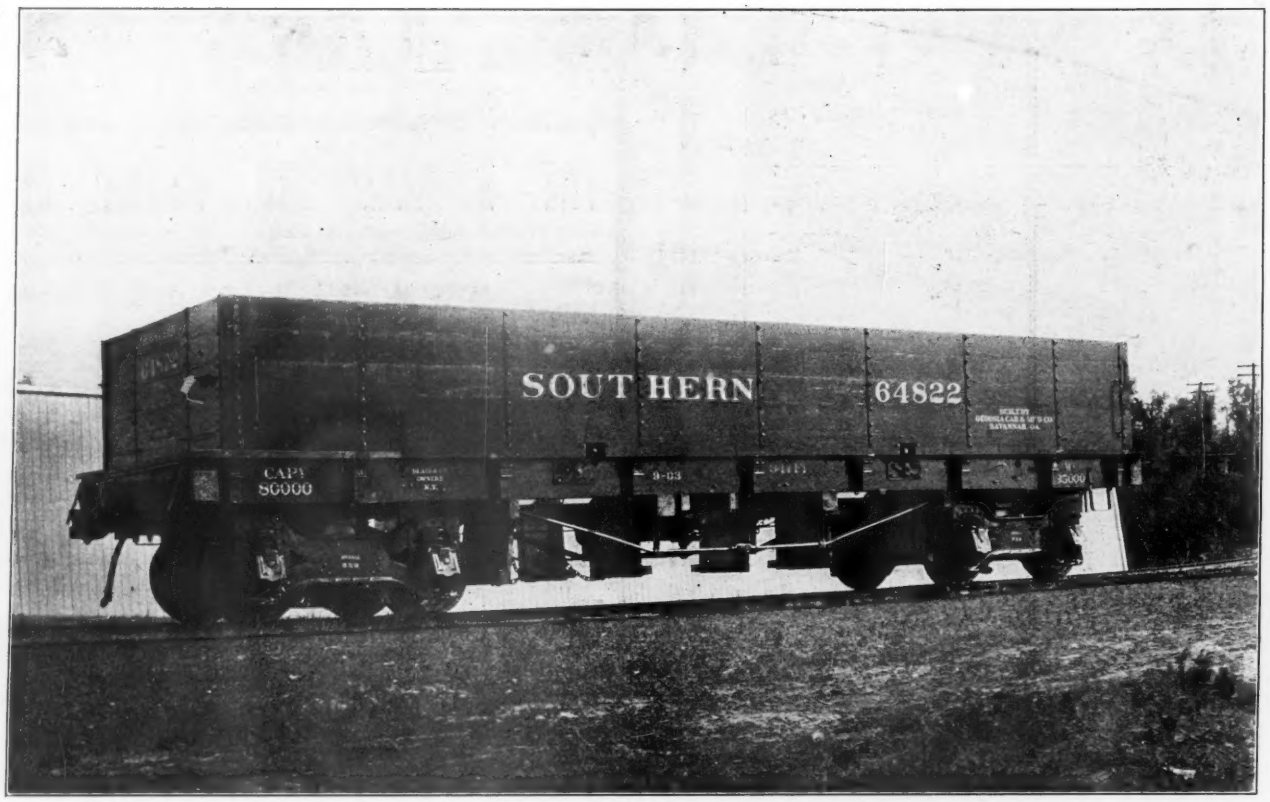

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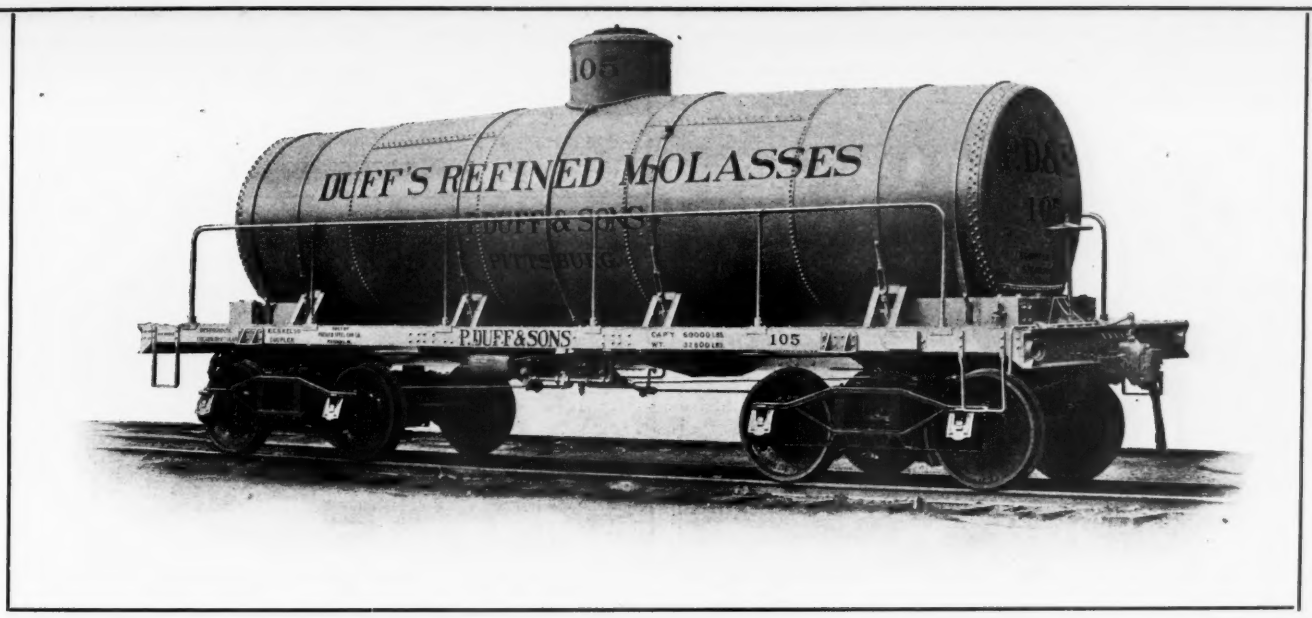

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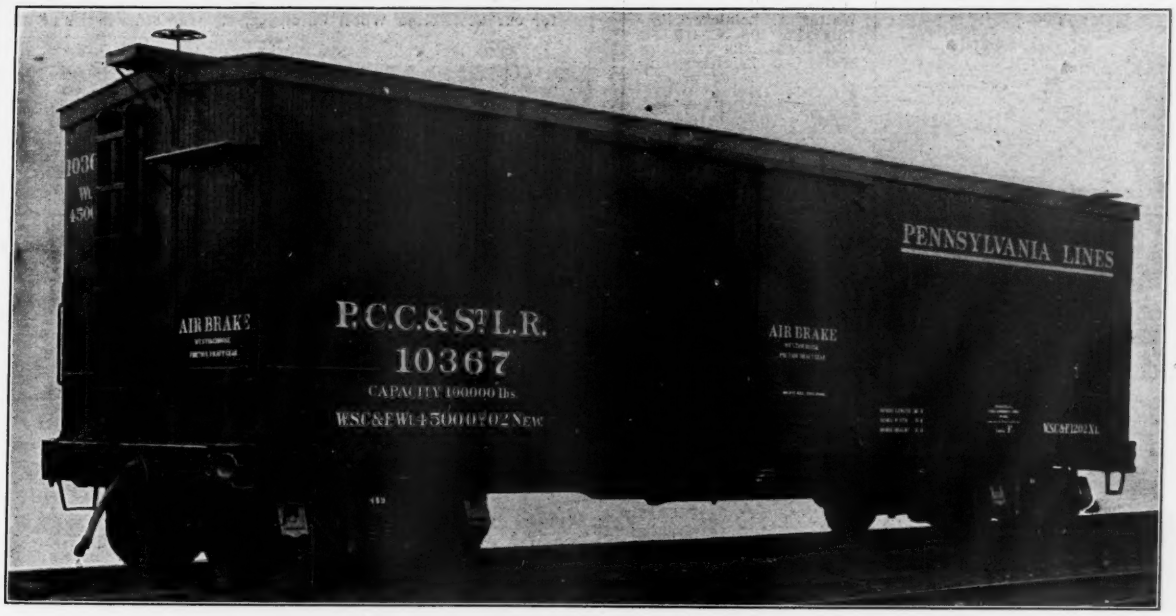

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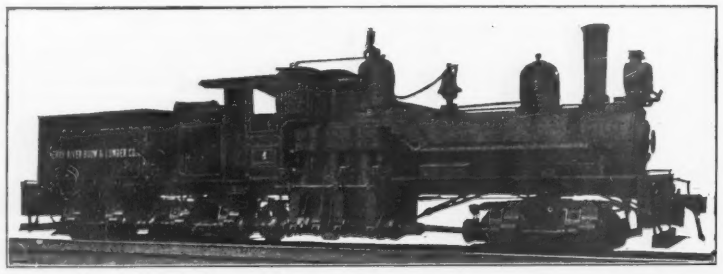

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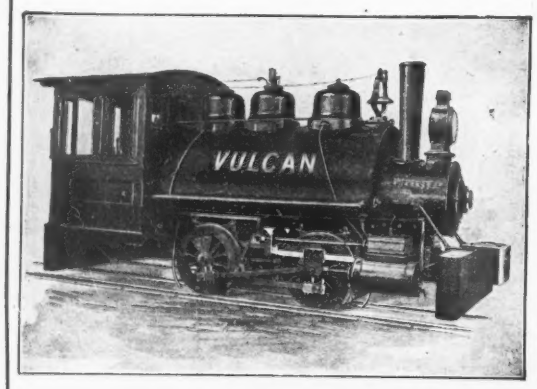

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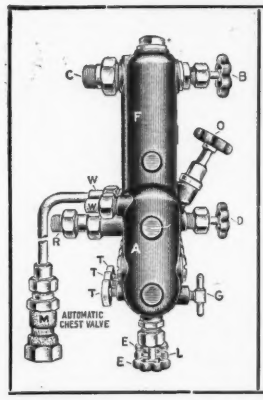

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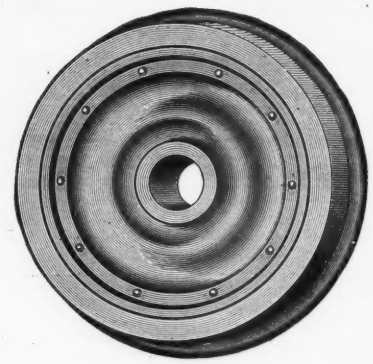

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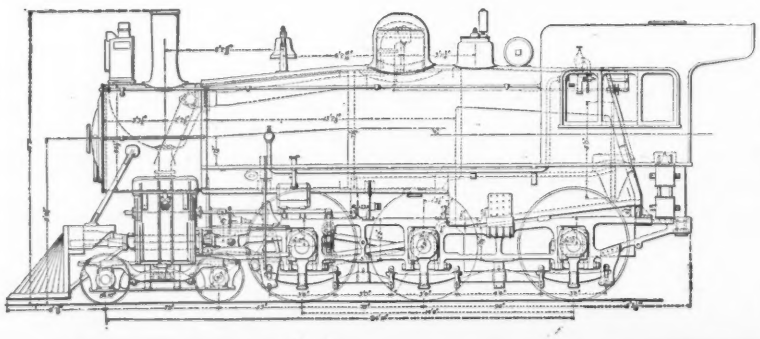

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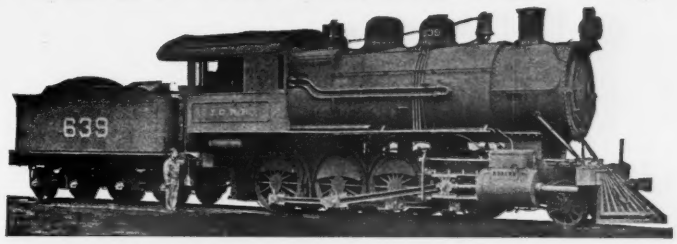

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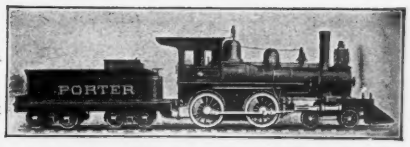

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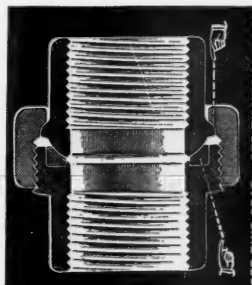

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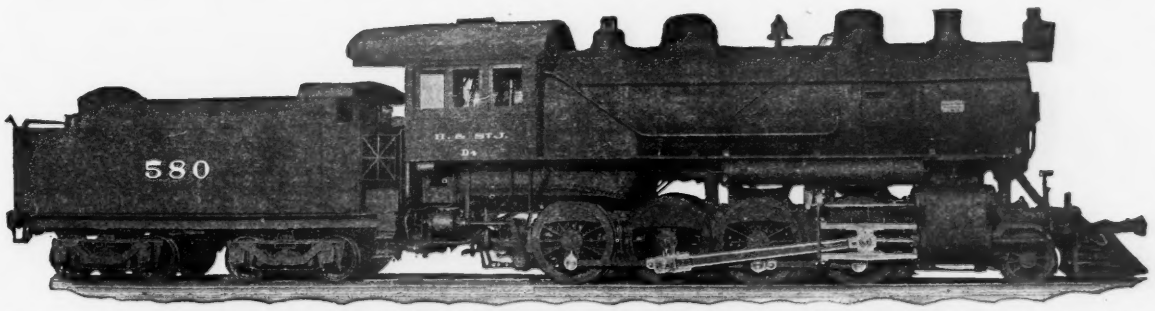

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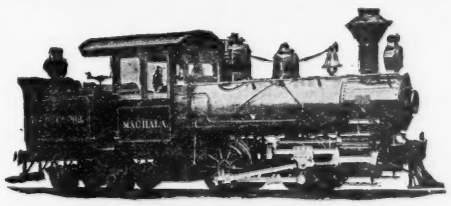

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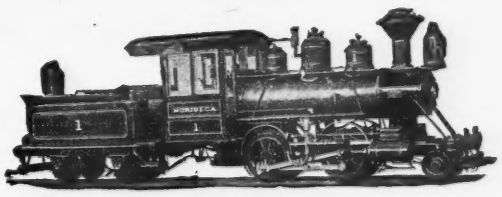

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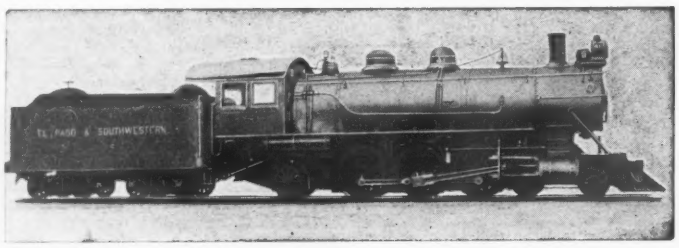

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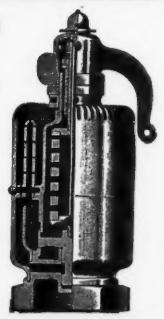

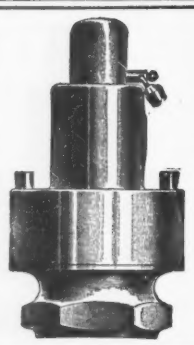

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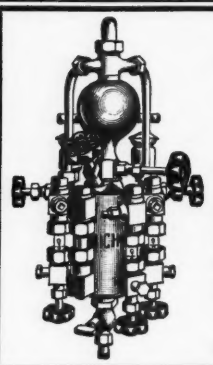

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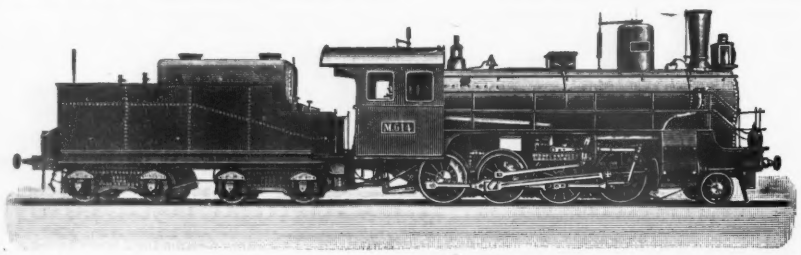

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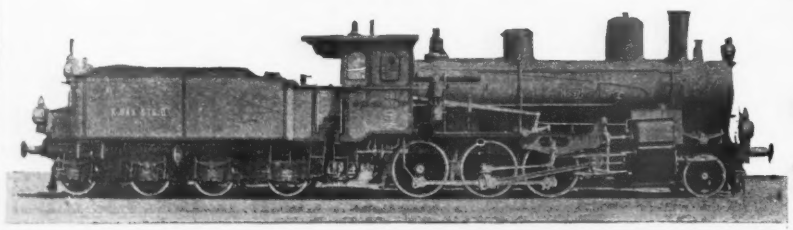

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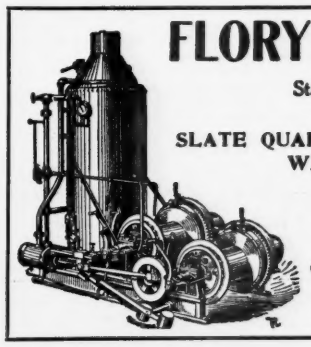

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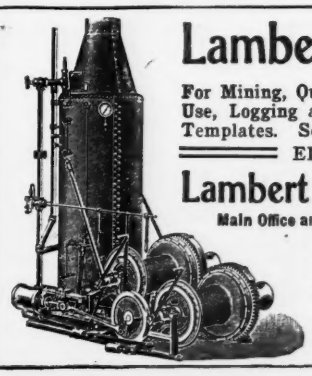

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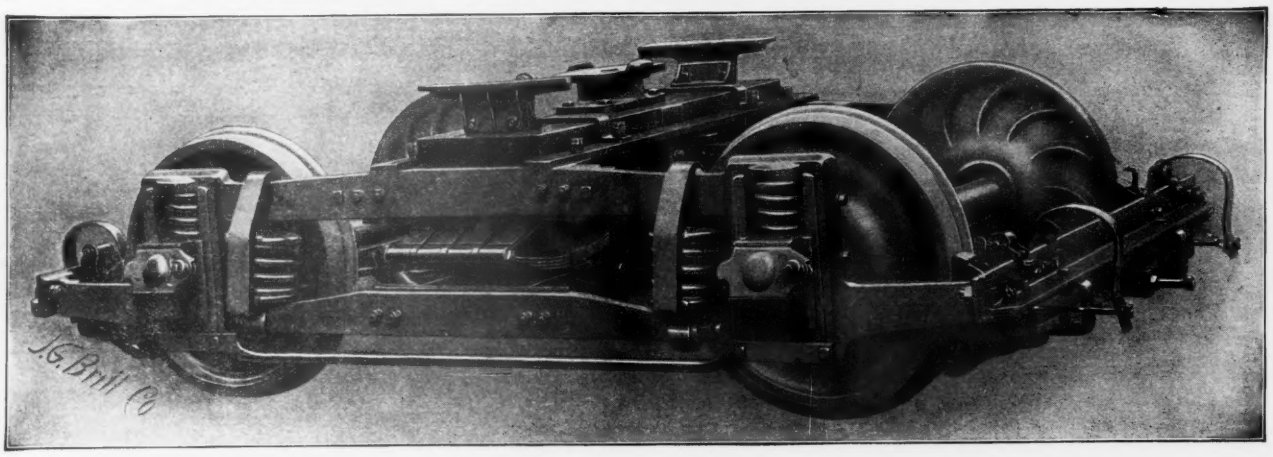
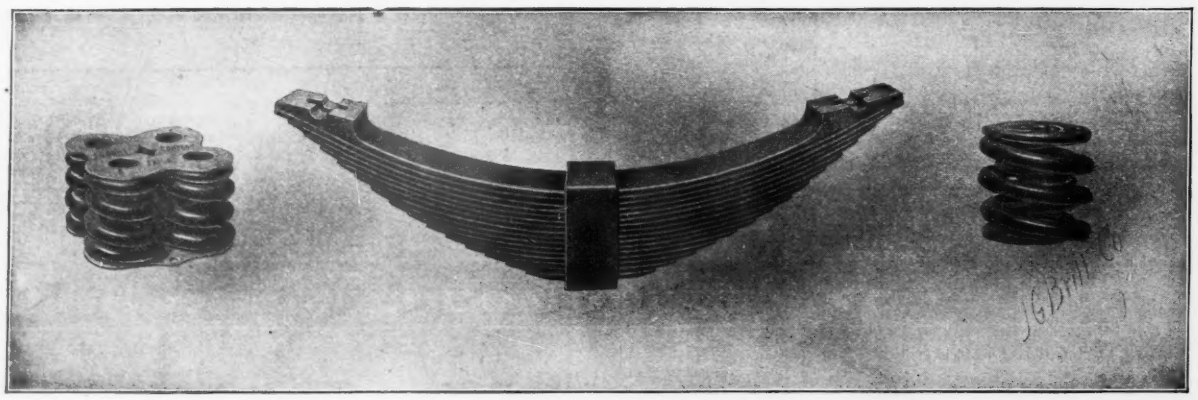


BRILL No. 27 TRUCK

The car body rests on the truck bolster, the bolster on the elliptics, the elliptics on the spring plank—from the spring plank to the journals the Brill No. 27 is totally different from every other truck—the spring plank bears centrally on the equalizing bars, the equalizing bars are suspended at their ends by spring links, the spring links are hung upon solid forged side frames near the yokes, the frames rest upon journal springs.



Manufacturers of LOCOMOTIVE AND CAR SPRINGS